JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second-class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3, 1879

VOL. XXIII NO. 13 SAN FRANCISCO, SEPTEMBER 25, 1909 PER COPY, 10 CENTS

Henshaw, Bulkley & Co.

ENGINEERS

Machinery Merchants

San Francisco: 19 - 21 Fremont Street
Los Angeles: 262 So. Los Angeles St.
Oakland: 1436 Fifth St.

OKONITE WIRE

OKONITE
TRADE MARK
REG. U.S. PATENT OFFICE.

THE STANDARD for RUBBER INSULATION

Okonite Tape, Manson Tape,
Candee Weatherproof Wire,
Candee (Patented) Potheads.

The Okonite Company
253 BROADWAY, NEW YORK

WILLARD L. CANDEE, PRESIDENT — GEO. T. MANSON, GEN'L SUPT.
H. DURANT CHEEVER, TREASURER — WM. H. HODGINS, SECRETARY

PARANITE

INDIANA RUBBER AND INSULATED WIRE CO.

Manufacturers of Paranite and Peerless Rubber Covered Wires and Cables
Underground Aerial, Submarine and Inside Use
Telephone, Telegraph and Fire Alarm Cables
All Wires are Tested at Factory JONESBORO, IND.

Electric Appliance Company
728 Mission St., San Francisco — Pacific Coast Agents

Standard Underground Cable Co.

MANUFACTURERS OF

BARE AND INSULATED WIRE AND CABLES

Chicago, New York — Pittsburg, Boston — Philadelphia, St. Louis — Atlanta, San Francisco

PACIFIC COAST DEPT. --- A. B. Saurman, Manager
First National Bank Bldg., San Francisco
Sub-Office—Los Angeles, Cal.

Phillips Insulated Wire Co.

PAWTUCKET, R. I.

"O.K." WEATHERPROOF
"PARAC" RUBBER COVERED

COMPLETE STOCKS CARRIED BY
OUR PACIFIC COAST AGENTS

California Electric Co. LOS ANGELES — Electric Appliance Co. SAN FRANCISCO — Western Electric Co. SEATTLE

Specify....

BROOKFIELD GLASS INSULATORS

The Standard

PACIFIC METER CO.

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

301 SANTA MARINA BUILDING
California and Drumm Sts. — San Francisco

VULCAN ..... Refrigerating and Ice Making Machinery

MANUFACTURED BY

VULCAN IRON WORKS

Office: 702 Atlas Bldg., 604 Mission St.
Works: Francisco and Kearny Streets — San Francisco

FOR INDEX TO ADVERTISEMENTS SEE PAGE EIGHT

SATISFACTORY SHIPMENTS

Besides the proper filling of your orders—without substitution, we get them out the day received.....

ALL THE STAPLE LINES AND THE NEW ONES AS WELL—
PRICES RIGHT

Standard Electrical Works

Six Sixty-nine Mission St.
SAN FRANCISCO

Pacific States Electric Co.
"The Modern Electric Supply House"

SUCCESSOR TO

Sterling Electric Co., San Francisco
Pacific Electrical Works, Los Angeles
Crescent Electric Co., Oakland

Electrical Supplies

Our stock is the most complete on the Coast. If you want good goods, low prices and prompt shipments, give us a trial

WRITE OUR NEAREST HOUSE

Pacific States Electric Co.

LOS ANGELES, 326-330 So. Los Angeles St. OAKLAND, 526 13th St.
SAN FRANCISCO, 133-147 New Montgomery St.

Bryan-Marsh Tungstens

25 watt	Clear	$ .80	Frosted	$ .85
40 "	"	.90	"	.95
60 "	"	1.25	"	1.32
100 "	"	1.60	"	1.70
150 "	"	2.25	"	2.40

Voltages 105 to 120. Obtain Discounts from

California Incandescent Lamp Co.

671-73 Mission St., San Francisco Kearny 1077

A Motor for Real POWER ECONOMY

You wouldn't hire six men to do the work that two could do with ease. Yet perhaps you continue to use six horse power to drive a distant machine, by old line-shaft methods, that only requires about two horse power when driven by one of our adjustable speed motors.

FORT WAYNE
MOTOR DRIVES

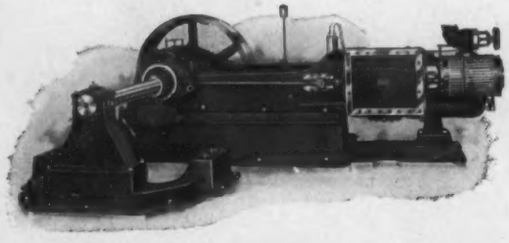
eliminate friction losses -- provide wide speed adjustments -- allow you to locate machines where work is -- increase the output and cut in half the cost of operation.

We have a bulletin 1415 on this subject that contains a lot of mighty valuable information and we want to send one to you. Write for it now.

Ft. Wayne Electric Works
Ft. Wayne, Ind.

Skinner Engines

THE STEAM TIGHT VALVE KIND



Skinner Engine Co.

ERIE, PA.

PACIFIC COAST REPRESENTATIVES

HENSHAW BULKLEY & CO., San Francisco
MACHINERY & ELECTRICAL CO., Los Angeles
J. M. MAIN, Chamber of Commerce, Portland

JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXIII | SAN FRANCISCO, SEPTEMBER 25, 1909 | NUMBER 13

ADDRESS BY THE PRESIDENT OF THE PACIFIC COAST GAS ASSOCIATION

BY W. B. CLINE.

To the Members of the Pacific Coast Gas Association.

Gentlemen: Owing to the serious illness of our president, Mr. George S. Colquhoun, and the resignation of Vice-President W. F. Boardman, due to his absence from the city, it becomes my duty, as the successor to Mr. Boardman, to address and welcome you at this, our seventeenth annual meeting.

Since the discussion of special topics of interest to the gas fraternity is best presented by papers on these particular subjects, I desire to simply touch upon some of the principal items of importance to the gas industry which have come to our attention during the past year. With this in mind, I have classified these remarks under the general heads of "Manufacture," "Distribution," "Rates," "Legislation," "Litigation" and "Miscellaneous," and will take up these subjects in the order named.

George S. Colquhoun, President Pacific Coast Gas Association

Owing to the severe illness of the President, the Vice-President, Mr. W. B. Cline of Los Angeles wrote the President and presided at the meeting.

Manufacture. During the past year there have been no new processes of any importance introduced for the manufacture of gas, which are of general interest to gas companies of the Pacific Coast. The manufacture of oil gas, or, as it is often termed, crude oil water gas, has become so general in California, that it is now looked upon as the process for this section of the country, and practically all companies which are located where a supply of oil is available, are using this method of manufacture. It is gratifying to note in connection with this process, that refinements are continually being made which tend to improve the quality of the gas produced, and decrease the oil used per thousand. As the gas is manufactured entirely from crude petroleum, the cost of that material is, of course, of utmost importance to gas companies, and notwithstanding the present enormous production of the California oil fields, the price seems to have been well maintained; in fact, the price of oil probably averages higher at the present time than a year ago. This is undoubtedly due to the rapidly increasing use of crude oil in manufacturing plants and by the railroad companies, and to the export business developed by the larger oil-producing companies.

The carbon residuum from the manufacture of oil gas is becoming quite generally used, especially by the larger companies, as a fuel for water gas, and is successfully employed in the present water-gas generators. Some of the companies producing large amounts of carbon, are briquetting the product and selling it for use as a domestic fuel. In some instances it has developed into a formidable competitor of hard coal, as one of the best solid fuels obtainable.

Distribution. The relative merits of high and low-pressure distribution are still receiving a great deal of attention from gas engineers and managers, and strong arguments are made for each of the systems.

The majority of the larger companies, however, seem to prefer a system, for well-built-up districts, which is a combination of the two; that is, of a street-main system composed of cast-iron mains for laterals and main trunk lines, fed at intervals through district governors connected to a high or medium-pressure belt line. Though this system of distribution was first employed by the companies in their efforts to furnish a proper supply of gas to districts far beyond the area originally intended to be supplied, and to correct the pressure troubles resulting from a street-main system which had become outgrown, it is now employed in laying out new systems, as it possesses most of the advantages incident to the use of heavy cast-iron pipe, without the enormous cost of a system built of excessively large-sized pipe, such as would be required for straight low-pressure distribution. Of course, the direct high-pressure system of distribution, with individual regulators, has its fields of usefulness, particularly in sections far distant from the storage holders of the company.

For calking the joints of cast-iron mains, both lead and cement still have their ardent advocates, and each material has its peculiar advantages, differing with the localities and conditions where it is employed. Strong claims are made for "lead wool," a patent calking material made of lead cut into fine shreds, to be driven into the joint cold, but it has not come into general use. My attention has been called to a pneumatic calking tool, used in connection with a small air compressor; this, it is claimed, materially reduces the time required to make a joint. Also to a trench-digging machine, which does the work of many men, in excavating for street-main ditches.

As to the material of which high-pressure pipe should be made, whether wrought-iron or steel, much difference of opinion exists; a very animated discussion on this subject took place at the last meeting of the American Gas Institute. A high-pressure installation worthy of note, was recently completed by the Los Angeles Gas and Electric Corporation; this consists of a 10-inch feeder line from the compressor station in Los Angeles, to supply gas to a district holder located in Pasadena. The line, at present, is about six miles in length, and genuine wrought-iron pipe exclusively was used in its construction.

Rates. From a careful perusal of a list of the gas companies of the Pacific Coast, and the prices charged by them for gas, I note the comparatively large number of concerns that maintain a rate in excess of $1.25 per thousand. Of course I know that conditions everywhere are not such as to warrant the companies making a rate as low as that in force in Los Angeles, for instance, but with my knowledge of conditions generally, and after many years' experience with companies whose policy has been to steadily reduce their rates, I am firmly of the opinion that many of our gas companies, particularly those in California, would be materially benefited by a reduction in the prices charged by them for gas. It has been my unvaried experience that a reduction in the gas rate, which is announced in advance and thoroughly advertised, results in an increase in business, not only in new consumers who are attracted by the lower price of the commodity, but in the consumption by old consumers, which more than offsets the decrease in revenue occasioned by the cut in the rate. Aside from the increase in the volume of its business, the company making the reduction reaps other benefits that are far-reaching: It anticipates the action of city councils and other rate-fixing bodies, whose members often reduce the rate to satisfy a popular clamor; municipal-ownership agitators are quieted; would-be competitive companies are discouraged; and finally, the people have a friendlier feeling toward the corporation than had the rates been reduced by some more or less arbitrary action of the city government. I confidently believe that most of the California companies now charging more than $1.25 per thousand, should reduce their rates; and if this were done, and the proposed reduction given sufficient publicity, as above outlined, the company's business ought to be improved by the change. There are probably some isolated cases where, on account of local conditions, a higher rate than that mentioned would be justified, but I hope to see, within the next twelve months, a general reduction in rates by those companies now charging in excess of $1.25 per thousand.

Legislation. The question of legislation, as affecting the rates charged and the service rendered by gas companies, is one of steadily-growing importance to us, which condition is largely the result of the activity in this direction by rate-fixing and business-regulating commissions of other States, particularly New York and Wisconsin. On account of the growing desire on the part of our city governments to regulate our affairs, I believe that the time has come for some action looking to the appointment of a State Commission for this purpose. At last year's meeting of the association, President C. O. G. Miller called attention to this important subject, and his suggestions in reference to the matter of an amendment to the California State Constitution, providing for the appointment of a commission to fix the rates to be charged by the public utility corporations, are deserving of the careful consideration of the members of this body. At the meeting last year, a committee was appointed, I believe; at least a chairman of such a committee was named, and I know that the question has been taken up by that gentleman during the past year. We now have ample time to get this matter in proper shape to present to the next session of the Legislature, which will be held in 1911, and I think it should not be neglected.

At the last session of the California State Legislature, a statute was passed, providing for the lighting of streets in districts outside of cities. This should encourage the better lighting of our suburban districts, and the gas companies should see that they obtain a proper share of such lighting.

Litigation. In the matter of litigation affecting the gas business, probably the situation in New York City, and the decision of the United States Supreme Court in the case of the Consolidated Gas Company of New York, contain the greatest general interest to us. As you probably are aware, this decision was the result of the suit brought by the Consolidated Gas Company to enjoin the city, and the State Commission, from enforcing the 80-cent gas rate which had been fixed for the city of New York. I will not take time now to review the various interesting points covered in the proceedings, but the gist of the decision, while it

upholds the gas company in certain of its contentions regarding pressure to be maintained, etc., was that the company did not make out its case on the question of rates with sufficient clearness to justify the court to interfere with the enforcement of the legislative act which fixed the rate; that the company must show by actual operation under the 80-cent rate that the same is confiscatory.

The gas companies in San Francisco are involved in a legal struggle which, in many respects, is similar to the New York case, the Supervisors of San Francisco having recently passed an ordinance fixing the gas rate at 85 cents, and the companies having sought the aid of the courts to enjoin the enforcement of the ordinance until the question of the illegality of this rate has been finally passed upon.

Miscellaneous. There is another matter of growing importance from the manager's viewpoint, and that is the practice of some gas companies of accepting bonuses from consumers for extensions of mains and running of services. Surely this practice is to be greatly deprecated. A gas company should be liberal in its policy of extending mains and installing services, upon the application of prospective consumers, and should not keep such consumers waiting for an indefinite period, when the district where the extension is desired is growing rapidly and steadily, but it should pay the entire cost of the work when done, and not force the public to bear any portion of it. One might, with as much reason, ask his customers to pay for the grocery wagon which delivers their groceries, or the dairy wagon which brings the day's supply of milk, as to ask consumers to pay for the gas company's distributing system. Some companies attempt to defend their action in accepting bonuses, by claiming that the consumers do not pay the same; that the cost is borne by the real estate dealers who are selling the property, and that the latter are glad to pay the gas company a portion of the cost of the extensions on account of the resulting enhanced value of the property. Of course this is a poor defense; the consumers are always the ones who, in the end, pay for a part of the gas company's plant. We do not ask the public to contribute to the cost of our works, why should it pay for our pipe systems? The gas company fixes its rates so as to bring a fair return on the cost of its entire plant; it certainly should own, and pay for such plant, and not ask the consumers' assistance.

Some of our gas companies have had serious trouble in the past on account of labor disturbances and the matter of wages. By giving the question of labor careful and frequent attention, and seeing to it that the hours of the employees in the various departments of our business are kept at a fair standard, and by maintaining the wages paid at a reasonable figure for the services required, we can accomplish much toward forestalling any serious labor difficulties.

Before closing, let me call your attention to the fact that some splendid papers have been prepared by our members for this meeting; these, together with the contributions from the "Wrinkle" and "Experience" departments, under the able editorship of the gentlemen having these departments in charge, will, I am sure, prove most interesting and instructive to the members of the association.

METHODS OF EDUCATION OF CONSUMERS.[1]

BY WM. BAURHYTE.

In the old days and before the introduction of the gas stove and electric light, the treatment of the consumer was a secondary consideration, if, in fact, he was considered at all by the then gas manager. In fact it was supposed by those in charge that conditions were always to remain the same. The gas manager of today has awakened. The keen competition that has to be met has stirred him to the depths and now the consumer is really a first consideration. But the consumer is a variable quantity and stands ready at all times to slander and vilify the corporation which is supplying his light, fuel and possibly power. How to prevent him "getting into a frame of mind" is the problem always before us. I do not know that I have anything new to offer on the subject but will state what has been done by the corporation I represent.

The first thing necessary in the education of consumers is the education of your employees. All the employees of the Los Angeles Gas and Electric Corporation in whatever capacity are required to treat all patrons with extreme courtesy. Those having complaints are given respectful attention by the employees of the investigation department. After ascertaining the nature of the complaint effort is immediately made to correct the same. If the party is an applicant for service or meter, or both, they receive prompt attention. No promises are made that cannot be fulfilled.

Another thing necessary in the education of the consumer is to provide a way whereby he can transact his business with as little friction and delay as possible. With this object in view our offices are provided with all up-to-date devices. We have also, stationed in the corridor, an information clerk whose duty it is to ascertain the business of each person entering and direct them to proper windows, to pay bills, apply for services or meters, or to usher them into the investigation department or direct them to any other department about the building. This clerk also saves both the party and the corporation considerable time by being able to furnish certain information at once.

It was early recognized that the word "complaint" was very suggestive and also that the complaint department in close proximity to other departments was undesirable. The word "complaint" has been entirely eliminated in our office. Instead we have an investigation department, separate and apart. It is a room by itself, thereby removing the dissatisfied consumer from the main office. Chairs and tables are provided. The consumer is met at the door by one of the clerks, with a pleasant greeting, invited to be seated and then asked to state his business. After the usual discussion and adjustment or promise to look into the matter, the consumer is accompanied to the door and bowed out. Immediate attention is given to the matter and a report rendered, either favorable or unfavorable, at the earliest moment. It is promptness and attention to detail that pleases.

Another method of education and one that has been found very effective is the employment of a force of ten solicitors, or more properly speaking, canvassers, whose business it is to look for trouble. We call them

[1]Paper read before 17th Annual Convention Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

"sentiment" canvassers. The theory is that as the corporation shows so much consideration for its patrons' comfort and convenience, the said patrons will in turn be inclined to believe that the corporation has more than the mere monetary interest derived from the privilege of presenting him with a monthly bill; in other words, it is to the advantage of the corporation to build up its good will and maintain it. These canvassers are equipped with a satchel containing a small wrench, screwdriver, burner pliers, burner cleaners and tips for gas burners. They are thoroughly instructed in the care and use of gas cooking ranges, hot plates, instantaneous water heaters and all other gas appliances used in the household. They are assigned to a district with instructions to visit each consumer and inquire as to the service that is being rendered.

Very often we have found that consumers will go for weeks at a time inconvenienced by water in pipes, stoppage in service or some little defect in gas stove or Welsbach burner which, if they only knew, could be remedied by themselves. They at once attribute such defect to bad gas, berate the corporation and do not give the corporation an opportunity to correct it. In many cases when asked why they did not notify the office, they have said, "We thought it was bad gas and that you could not help it." Upon being informed that the supply is bad this solicitor proceeds to investigate. If it is improper adjustment of stove or Welsbach burner, he soon remedies it. Perhaps it is a case of bad light from an open tip burner. That is adjusted.

If there is really bad service having other causes and which he cannot repair he promises immediate attention which is promptly given upon receipt of his order by the investigation department. The solicitor makes a complete record of his visit to each consumer, stating whether satisfied or dissatisfied. If the latter is the case he states the causes which have brought about that condition and what has been done to remedy same. After a few days the solicitor calls again to ascertain if everything is satisfactory. If conditions are still unsatisfactory he makes a speical report to the investigation department which calls the attention of the superintendent of distribution to the case, who gives it his personal attention with the result that the consumer is satisfied and the corporation has one more friend.

The work of the solicitor is supplemented by advertisements in the daily papers, calling attention to the really superb service rendered by the corporation and stating that any faults that may exist are purely local in character and can be quickly remedied if the party using the gas or electricity will at once communicate with the investigation department. We find also that these solicitors are very useful in satisfying consumers who are dissatisfied with their bills. After going over the house and inspecting gas appliances and also noting conditions, they are able to call attention to useless consumption of gas or electricity and to suggest ideas whereby the consumption may be reduced.

This attention and apparent interest is very pleasing to patrons. By this method they are led to believe that the corporation actually is trying to serve them in a proper manner and at the least possible cost to the consumer.

Another method to please is the furnishing of gas to outlying districts. Our city is growing with such gigantic strides that the outlying districts are being rapidly built up. The question of gas supply is of great importance to those contemplating settling in such sections. We have steadfastly refused to accept bonuses for laying mains in such districts, but instead have guaranteed a gas supply when a certain number of consumers have been assured us, and have kept our word. The result is we have gained many friends and we keep them.

THE PORT HURON DECISION.

In the case of the City of Port Huron, Mich., against the Port Huron City Gas Company, in which the complainant asked for an injunction to prevent the gas company from reducing the price of gas from $1.40 to $1 for lighting, claiming that such price was exorbitant, Judge B. R. Erskine decided that they did not prove their case.

"The rates heretofore charged by defendant to its consumers were $1.40 per 1000 feet for illuminating gas, less a discount of 15 per cent if paid within ten days, and $1.00 per 1000 feet for fuel gas, with a discount of 20 per cent if paid within ten days. The rate now proposed is $1.00 flat rate for both fuel and illuminating gas, and it is this proposed rate that is attacked as unreasonable.

"It is conceded that the Court has not the power to fix the rates to be charged by defendant company to its consumers, but has the authority on a proper showing, to say whether the rate proposed is or is not unreasonable.

"Assuming then that it may be inferred from the bill of complaint that the proposed rate increases the cost of gas to the consumer, a point I do not determine, the question remains whether there is sufficient showing of unreasonableness to entitle complainant to the relief prayed.

"The Court may not say arbitrarily that a given rate is unreasonable. What may be reasonable under certain conditions, may be unreasonable under others. The question involves a consideration of the amount of money actually invested in the enterprise, the gross income, the operating expenses, the fixed charges and fair dividend on the capital stock, etc.

"The only showing made by the city is by its bill of complaint verified by the mayor. While it may be presumed that he is fairly conversant with the affairs of the city, it will hardly be assumed without some showing to that effect that he is so intimately acquainted with the affairs of the company as to safely express an opinion on this subject. If he has such knowledge, he should set forth sufficient facts from which he makes his deductions. What dividend he would regard as unreasonable upon the capital stock of the company does not appear. Minds may differ upon this matter, and as the case is presented at this time, the Court must take, in order to issue the injunction, the conclusion of the complainant that the rate to be charged is exorbitant without knowing upon what facts the opinion is based or how the conclusion is arrived at.

"On the showing made I do not feel justified in allowing the writ. The application is therefore denied."

GAS DISTRIBUTION IN SAN FRANCISCO.[1]

BY W. R. MORGAN.

The distributing system of San Francisco is the result of about sixty years' growth. It represents the efforts of eight companies that have flourished for longer or shorter periods since the year 1852, when the San Francisco Gas Company was incorporated. Subsequently, the following companies came into existence:

1862—The Citizens' Gas Company.
1870—The City Gas Company.
1871—The Metropolitan Gas Company.
1872—The Central Gas Company.
1883—The Pacific Gas Improvement Company.
1898—The Equitable Gas Company.
1901—The Independent Gas and Power Company.

All of these companies have been absorbed by the original San Francisco Gas Company, now known as the San Francisco Gas and Electric Company, which has inherited from them some three hundred miles of street mains. Each system has contributed its advantages and defects: its services, valves, drips, and leaks.

The Potrero, San Francisco.

A complete plan of the mains would be practically a street map of the city. Nearly every house is reached by the services, and every gas street lamp is supplied from the mains.

The entire low-pressure system is of the arterial type: that is, open from end to end to the free passage of gas. Considering its hap-hazard growth and lack of comprehensive design it is better adapted to its purpose than might be supposed. The various independent lines have been so tied together that individual deficiencies are supplied by the strength and completeness of the whole.

In localities where consumption is greatest two mains are used, one in either side of the street. This double arrangement affords advantages that cannot be secured when only a single main is available; for example, shorter services; greater storage capacity; lighter drag at peak hours; and insurance of uninterrupted service, as either main will suffice temporarily, should a stoppage or serious break occur in the other.

In outlying districts there is a scarcity of large mains—two-inch and four-inch being commonly used. Two-inch mains are being replaced gradually with larger sizes and no more two-inch pipe is being laid except in ungraded and unpaved streets, where the number of services to be installed will not exceed four or five. The problem involved is not the theoretical capacity of the main according to Pole's formula, but the great uncertainty regarding its condition after a few years' use. Unless there is a fall of at least 5 per cent a trap is likely to occur; moreover, two-inch pipe is easily choked by napthalene, and a long run is not readily cleared. Invariably such mains have been prolific sources of complaints, and are maintained only at an expense unduly great compared with larger mains.

Fig. 1 shows fluctuations of pressure caused by water in a two-inch main. This record was made in a

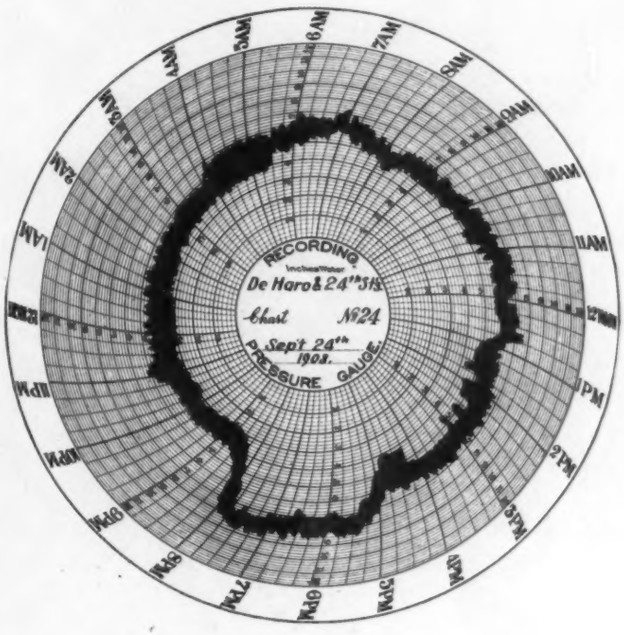


Fig. 1.

Bristol recording gauge placed near the end of a 600-foot run supplying three consumers. The amount of water in the main would have been unnoticeable in a four-inch main.

The city of San Francisco is built upon the northerly end of a narrow peninsula lying between the Pacific Ocean and San Francisco Bay. On the north is the well known "Golden Gate," a narrow, picturesque channel connecting the ocean and the bay.

Regarded as a field for gas distribution the city is approximately square, with boundary lines conforming closely to the cardinal points of the compass. The area to be supplied is thirty-six square miles. Elevations range as high as 450 feet above sea level, and the nature of the soil varies from alluvial deposits and sand to a fairly hard granite. Dividing the area by center lines into four equal squares, the northeasterly section is occupied by the business district and Western Addition; the northwesterly by the Richmond district; the southwesterly by the Sunset and Parkside, and the southeasterly by the Mission and Potrero.

Gas is supplied from Potrero Station, located on the bay shore at about the middle of the easterly boundary. From this point the two principal trunk

[1]Paper read before 17th Annual Convention Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

lines (24 and 30-inch) extend westerly and northerly a distance of four and one-half miles to North Beach Station on the northerly boundary line of the city.

No gas has been made at North Beach since April, 1906, but a 2,000,000-foot storage holder is still utilized, being filled during the day and gas delivered at night by means of a blower and a compressor.

from trunk lines and in turn supplying a gridiron of smaller mains extending through every street and alley and connected at every crossing.

Richmond, in the northwesterly corner, has presented a serious problem. Until 1906 this was a sparsely settled district provided only with two-inch and four-inch mains. It is three miles from North

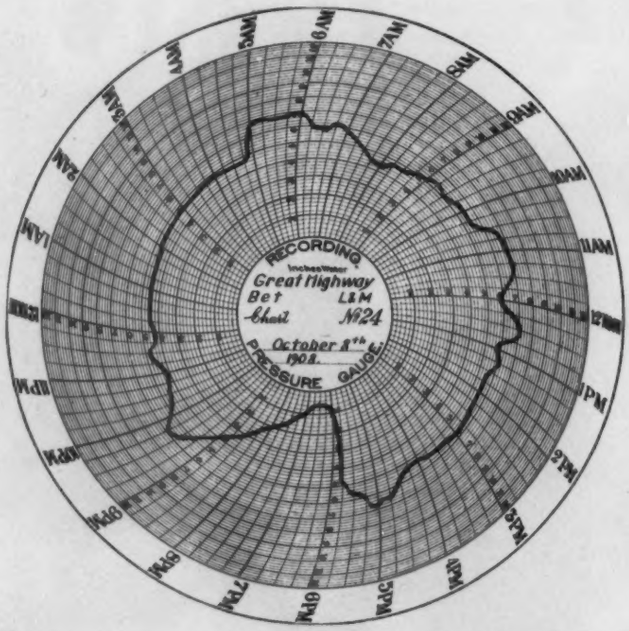


Fig. 2. Low Pressure, Richmond District. Before Improvements.

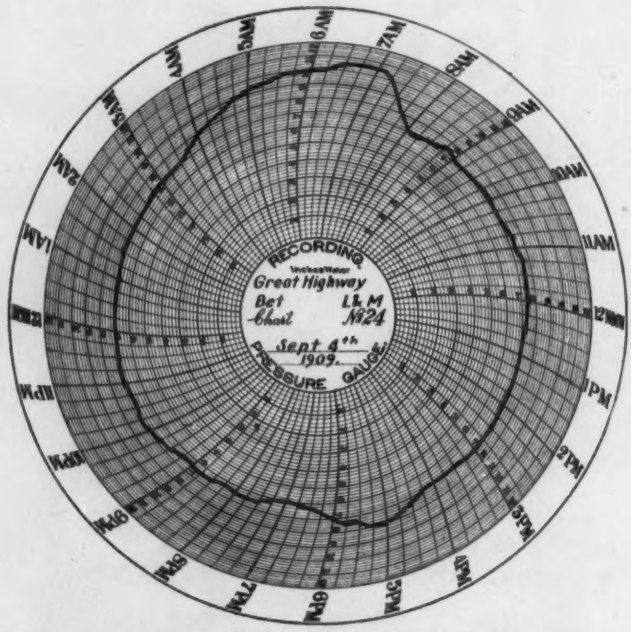


Fig. 3. Low Pressure, Richmond District. After Improvements.

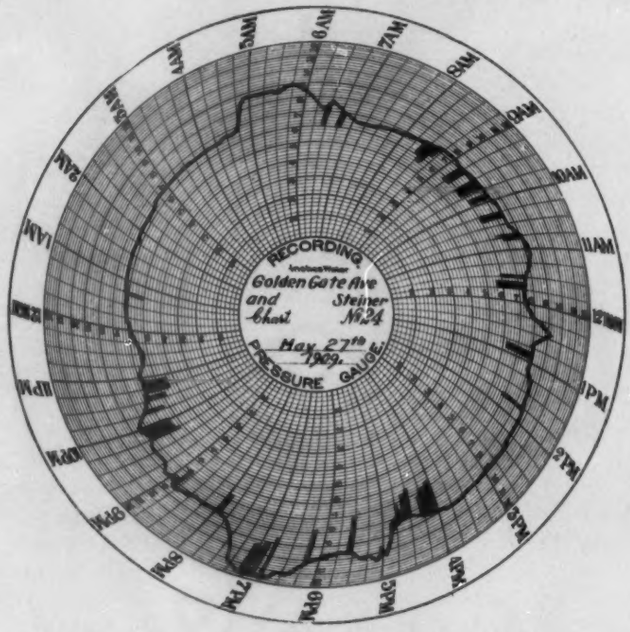


Fig. 4. Ocean Beach. Before Improvements.

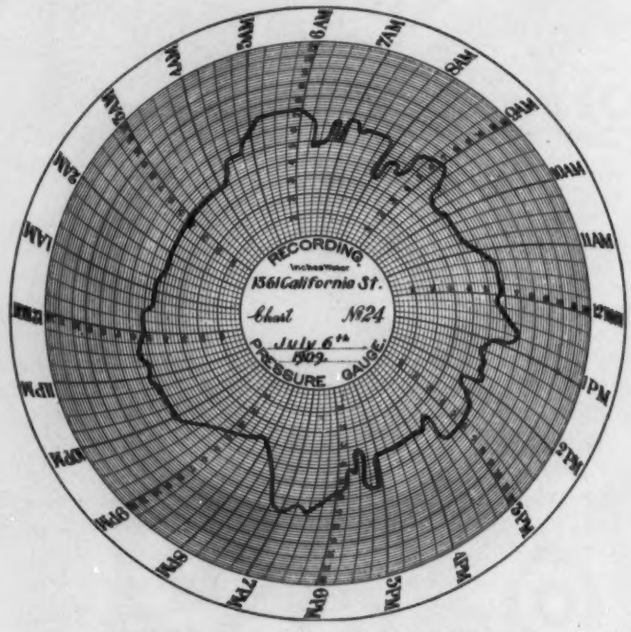


Fig. 5. Ocean Beach. After Improvements.

The northeasterly quarter section includes the original mining town of early San Francisco, where in 1852 Peter Donohue started his infant gas works at First and Howard streets. This section is amply provided with large mains well connected, and having a good circulation. Sizes run from ten-inch to twenty-inch in the principal streets, the mains all branching

Beach Station and six miles from Potrero. Dead ends were the rule and services were small (mostly one-inch). Shortly after the fire the population was increased fully fourfold by an influx of people who had been burned out. Every vacant house was filled and many new houses and stores were quickly built. The combination of small mains, long distance, and sudden

increase of consumption developed a deplorable "no gas" condition. A four-inch auxiliary high-pressure line from North Beach Station furnished the principal supply, although with a 14″x16″x12″ compressor it was difficult to keep a pressure of twenty pounds per square inch at the station.

Lately the situation has been relieved by the extension of a twelve-inch low-pressure main for a distance of two miles through Point Lobos avenue (the principal thoroughfare) with direct connection to a twenty-inch feeding line. All laterals have been connected, thousands of feet of two-inch main replaced with four and six-inch, and many dead ends eliminated. A new 16″x17″x20″ compressor has been installed and during peak hours a pressure of thirty pounds is maintained at the station. Two Chapman-Fulton district governors are located at suitable points and set to keep a pressure of not less than five inches in the distributing system.

The service now is very satisfactory and complaints have dropped to normal. Figs. 2 and 3 show pressure conditions in Richmond before and after improvements were made. Figs. 4 and 5 show charts taken at the extreme southerly end of a main extending along the ocean beach before and after improvements.

Sloping to the ocean beach south of Golden Gate Park, lie the Sunset and Parkside districts. The soil here and in Richmond is composed of clean wind-blown sand which has been swept in from the beach over barren dunes, and piled in shifting drifts and ridges. During the season of the westerly trade winds, a trench left open at night in any exposed location will be filled with sand and all traces of its existence obliterated before the following morning.

Pipe laid in this ground lasts about as long as when stored in a warehouse. Near the beach, however, unprotected wrought-iron pipe is affected by the corroding action of salt wind and fog from the ocean.

The Sunset is supplied by means of a low-pressure system boosted at peak hours by high pressure from a two-inch main extended from the high-pressure line in Richmond. This main also extends southerly to the newly built settlement of Parkside, which is the only exclusively high-pressure district in San Francisco; about seventy-five houses are supplied by means of ½-inch services, No. 1 Equitable governors, and ordinary five-light meters. The installation gives less trouble and the district is the source of fewer complaints than any equal area in the city.

The Mission is a densely populated residential district. This and the Potrero in the southeasterly corner is supplied from the 24 and 30-inch trunk-lines, by 10, 12 and 16-inch feeding mains, and the usual network of smaller mains. Throughout the whole system of cast-iron mains, lead joints are used exclusively.

House services vary in diameter from one inch up. Nothing less than 1¼-inch has been installed during the past ten years, although thousands of smaller services (relics of former times) are still in use. Present practice favors generosity in regard to sizes. The constantly increasing use of gas appliances demands 1½-inch and two-inch pipe in houses which formerly could be supplied by means of one-inch and 1¼-inch.

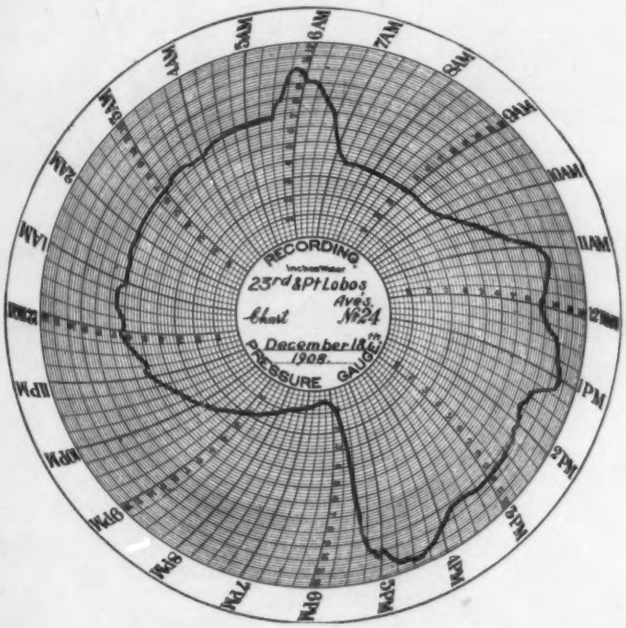


Fig. 6.

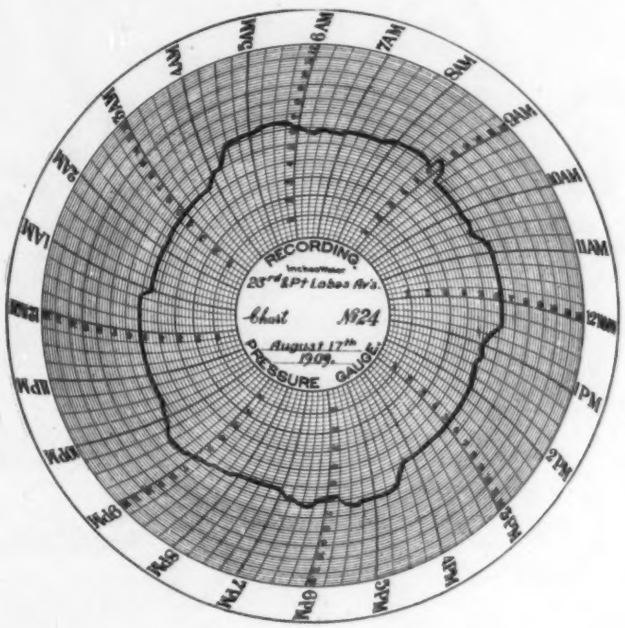
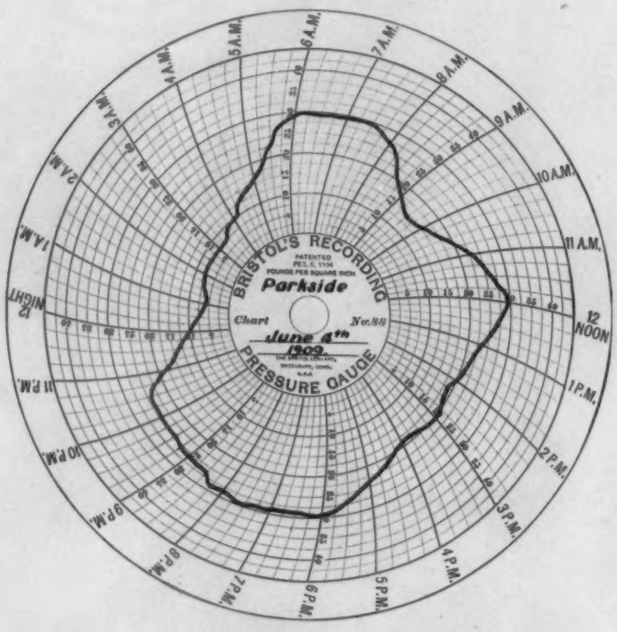


Fig. 7.

Figs. 6 and 7 show charts taken on services supplying water heaters in addition to the customary burners for illumination. It has been found advisable in many such cases to install separate services to supply heaters which require a rapid flow of gas. When lights and heaters are supplied from a single service, the irregular demands of the heaters cause quick variations of pressure and flickering lights unless the service is extravagantly large. A 1½-inch service costs only 10 per cent more than a 1¼-inch, while the difference in capacity is 40 per cent. The larger service, moreover, has advantages aside from mere capacity. It is not so easily choked or trapped as the smaller sizes: pipes and fittings are stronger; leakage is reduced and the life of the service lengthened.

During the last few years particular attention has been devoted to the matter of meter locations. It is required in every new building that a suitable place shall be provided for gas meters in the part of the building near the street and not higher than the ground floor; where light and ventilation is good; where the meters may be reached easily by statement-takers; where they are accessible in case of fire; and to where the service pipe can be run without elbows, bends or traps.

About 200 old services are being overhauled per month and larger pipe installed, bends and drips removed, and meters reset in accordance with the conditions outlined above. Meters range in size from three-light to 200-light, including Pacific, Maryland, American, Keystone, Harris, Standard, Detroit, Ohio, Laporte, and the Sprague iron meter. Three-light, five-light and ten-light meters are set with lead connections; all larger than ten-light have iron connections.



Parkside Chart.

The use of three-light meters is being discontinued in favor of five-light. Under average conditions, the life of a meter is six years. If kept in commission for a longer period it is liable to become inaccurate and leaky, or break down altogether. After six years' use leather diaphrams are generally dry and hard, the oil having been evaporated, and the meter becomes "slow" or possibly fails to register.

To simplify the regular changing of meters they are painted a different color each year. Those set during the year 1904 were painted green; in 1905 blue; 1906 red; 1907 yellow; 1908 dark lead; and in 1909 cream color. This year all green meters are being taken to the shop for a general overhauling.

Street lamps have one-inch services and three-quarter-inch raise pipes. They are provided with Welsbach mantles which are supplied and cared for by the Welsbach Company under a contract with the gas company. Of the 5000 in use, 340 are "triple tops," i. e., having a cluster of three lamps supported by a single post.

The subject of complaints is the liveliest storm center in all the affairs between a gas company and the general public. This is a remarkable condition in view of the fact that the desires of the complainant and the interests of the company are identical. However far apart the principals may be regarding rates, or whatever differences of opinion may exist between them concerning the veracity of a meter, or the equity of a bill, they surely meet on common ground when it comes to the complaint question.

Nine times out of ten the consumer wants more gas and ten times out of ten the company is eager to accommodate him. The only difficulty hinges upon the ability of the company to furnish a satisfactory supply quickly enough. A consumer with a complaint is generally saturated with the idea that he is not getting a proper return for his money. He fails to consider that for a small monthly payment he enjoys the

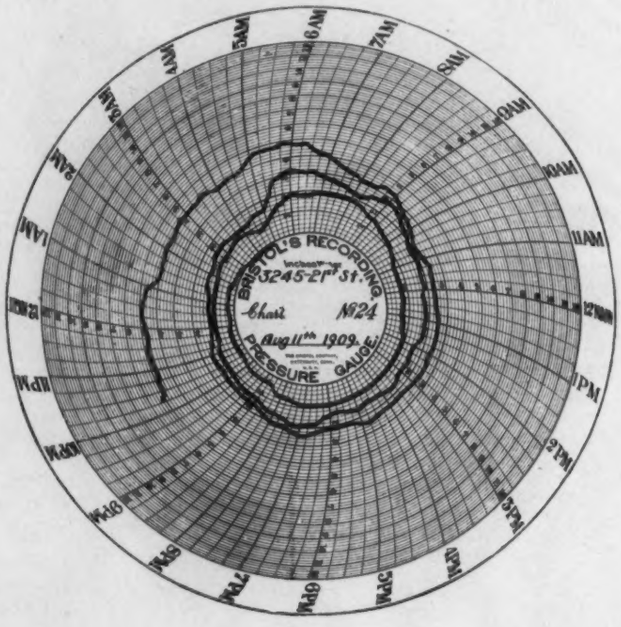


Fig. 8.

use of an investment running into millions of dollars; of a plant that is the result of study and experiments extending over a period of more than one hundred years; of an organization that is almost military in its discipline and efficiency, and whose whole end and aim is to give him continuous service.

It is impossible for the company to prevent occasional stoppages. The number of complaints at the most is very small compared with the number of services—seldom amounting to 1 per cent per day.

Climatic conditions in San Francisco are particularly favorable for the rapid formation of napthalene in service pipes and meters that are exposed to the air. From May until October the forenoons are usually warm and clear, followed by a cool sea breeze with banks of fog in the afternoon. The change of temperature is sufficient to affect exposed services and start an avalanche of complaints of poor pressure.

Fig. 8 presents a graphic illustration of the

formation of napthalene in a service pipe. Between 6 and 10 a. m. the pressure was reduced three inches, conditions becoming steadily worse until gas was practically shut off forty-eight hours later. Instances have occurred in which only ten hours elapsed between the commencement of trouble and the final stoppage.

At the particular instant a "no gas" wail reaches the office probably not a single pump man is available. It is not practical to keep men lined up waiting for complaints, still they offer the best possible opportunity to make either a friend or an enemy. At such times delay means dissatisfaction to consumer, with a big by-product of prejudice against the company.

In order to get quick action in these cases, it has been arranged that a few of the "trouble men" shall telephone to the office for orders while on their rounds, the calls being timed so that one is received about every hour. Thus it is possible to have a complaint investigated and the cause removed within thirty minutes after the message has been received at the company's office.

Ninety per cent of complaints are on account of poor pressure, caused by napthalene in service pipes or meter connections. A little gasoline blown through the service with a force pump is sufficient ordinarily to clear the pipe. Particularly stubborn cases require that the services shall be overhauled and thoroughly cleared by mechanical means. Some months ago a six-inch service supplying a local cannery became badly choked, and was cleared by disconnecting at the main and blowing the pipe out with steam by means of a hose connected to the boiler.

In the congested district of San Francisco street conditions below the surface are somewhat discouraging. From curb to curb to a depth of from six to ten feet, the space is filled with iron, brick, and concrete structures. The street railroad right-of-way covers eighteen feet. Into the remaining space is packed telephone, telegraph, electric light and power conduits, with manholes up to ten feet square; gas and water mains and services, with valves and drips; sewers with manholes, catch-basins, and laterals; an occasional steam line, and numerous abandoned pits formerly used in connection with cable railways.

In the crossings the city is building water cisterns thirty-four feet in diameter, and the gas company has been politely advised by the city engineer to remove its mains from the cistern areas.

If by any possible chance a cross is found with an outlet plugged, some foreign company hastens to fit a re-enforced concrete manhole neatly and snugly up against the plug. There is at least one consolation derived by the gas company in such a case. We are sure the plug will not blow out.

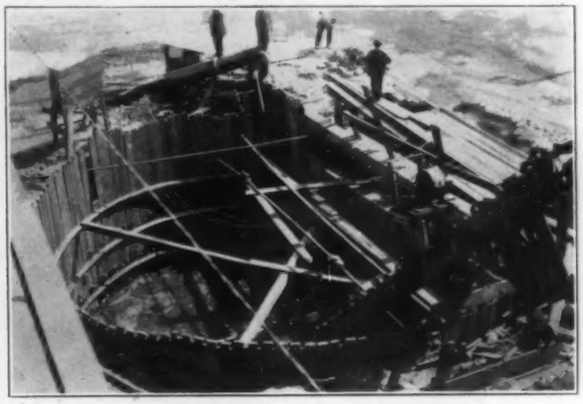
During the last half century fewer changes have been made in the distributing system than in any part of the company's plant. The construction of the works, the material used, and methods of manufacture have all undergone radical changes; even office methods have been revolutionized. With gas made from a new material, by a new process, and consumed in burners embodying newly discovered principles, the means used for delivery have remained practically the same for a period of fifty years.

In all probability before the next meeting of the Pacific Coast Gas Association, this apparently unchangeable equipment will have joined the general march of development toward a greater efficiency. Plans have been prepared for the installation of a sixteen-inch high-pressure main from Potrero Station to North Beach Station, designed to carry gas under a pressure of forty pounds per square inch.

Five district governors are to be located at points from which the Mission, Sunset, Richmond, Western Addition and business district each can be furnished with a supply far in excess of present demands, and this without adding to, or materially altering the existing low-pressure system.

The plan is to change the catenary curve of a long chain, to practically a horizontal line by means of equidistant supports between the abutements. When this has been accomplished, "peaks" will lose their terrors and the increase of gas consumption in San Francisco will be anticipated for fully fifty years to come.

30-Inch Main Slung on I Beams During Construction of Sewer.



Water Cistern in Course of Construction.

Street car mail boxes are in successful use in Grand Rapids and Des Moines. These boxes are placed outside the car so as to be readily reached. The cars all come to one central point where a postman is stationed to remove the mail and start it to the postoffice.

EFFECTIVE GAS LIGHTING.[1]

BY R. J. THOMPSON.

The gas lighting industry of today, depends for its success and effectiveness upon the appliances utilizing the incandescent gas mantle, invented by Dr. Carl Auer von Welsbach, and in considering the subject of this paper, we will deal only with the applications of this principle.

The source of light is generally at some point above the space to be illuminated, so that unless a lamp so suspended directs the greater quantity of its light downward, it is necessary to use a reflector of some description to divert the rays into the lower hemisphere for effective illumination. An increase in the illumination in the lower hemisphere without the use of reflectors has been obtained by the recent development of the inverted incandescent gas lamp. This lamp naturally gives a greater flux of light in the lower hemisphere without the use of special reflectors. This lower hemispherical distribution, however, may be materially increased by using reflecting glassware, combining a decorative effect which adds materially to the beauty of the installation while serving to distribute the light at the same time according to the needs of the consumer.

The inverted incandescent gas lamp in addition to this economy in the distribution of light, directing the greater quantity where it is most needed, shows an economy in the amount of gas consumed because the conditions of combustion in this lamp are more favorable, thereby increasing the candlepower of the mantle per cubic foot of gas consumed. For these reasons the inverted incandescent gas lamp is the most economical device for artificial lighting now in general use.

The importance of convenience as a factor in effective gas lighting is worthy of consideration. Positive and convenient methods for lighting and extinguishing these lamps are in general use. Installations of considerable size can be controlled from an accessible point by means of an electric jump-spark system operated by a push button. There are also systems operated by magnetic valves and push button, others by the "by-pass" system for individual lights and independent pilot systems for small cluster installations and for show window light, etc. Separate cluster pilot lights as well as pilots on individual lights prove very satisfactory in connection with inverted gas lighting. One can readily appreciate the convenience of being able to lower the light and yet have a dim flame by which to see the outline of objects in a dark room. There are many who adjust their pilot lights for that purpose and thus do away with the fumbling for matches or hesitancy in walking directly to the lamp, when with a pull of the chain, light supersedes darkness.

A further advance in effective gas lighting has been made in developing different sized units to meet all conditions. "Junior" light can be used with ordinary gas or electric globes on any chandelier or wall bracket where a moderate amount of light is desired. Its consumption is two feet of gas per hour and it gives about 50 candlepower, or 25 candlepower per cubic foot of gas consumed. It is very conveniently designed. The burner is arranged with an adjustable gas check and the mantle is designed in connection with a mica chimney, in which it is mounted; the mantle is thus protected from injury in handling during transportation or installation. Beginning with the "Junior" light giving 50 candlepower as a small unit, we can ascend the scale through larger sized individual lights to cluster and arc lamps, containing a number of mantles and giving a maximum of from 300 to 500 candlepower. What has been accomplished in the "Junior" light is also being developed in inverted gas lamps, and one can now obtain all sizes in inverted arcs and clusters up to the 500 candlepower inverted gas arc lamp.

Considering the possibilities of this range from 50 candlepower to 500 candlepower in the upright and inverted gas lamps, we certainly can claim to meet all the conditions imposed by the various forms of commercial, industrial and home lighting. In home lighting the incandescent gas lights meet conditions, where decorative effects are desired, much more readily than other methods of gas illumination, because the units yield a greater amount of light and thus afford ample illumination for the purpose for which the light is to be used, and in addition allow the decorator or artist greater latitude in the production of pleasing effects. By combining the style and finish of the fixture and the design and color scheme of the glassware with the proper distribution of light we can meet the most exacting requirements of the artist and decorator without departing from the principles of economical and effective gas lighting.

Artificial light is probably more abused and more wastefully used than any other commodity. It is an expensive necessity. The cost of lighting is an item of expense in the operation of large industrial plants, large office buildings, department stores and similar institution. This applies in a smaller way to home and shop lighting. The persons designing or constructing buildings are often responsible for the wasteful use of light. Very often the details of the piping for gas, the number, size and position of the outlets, receive very little consideration and the matter is often placed in the hands of the plumber or his assistant. In a small house, one is apt to find the library lighted with a single outlet in the center of the room with no provision for wall brackets; the kitchen with an outlet between two windows; the bedroom with an outlet in the center of the room so that the chandelier will hang directly over the foot of the bed, and bracket outlets placed to come behind the bed. Such an arrangement as the foregoing will not only be found to apply in the case of small dwellings, but the arrangement of the outlets in office buildings and stores, apartment houses, etc., is often quite as poor, so that in many cases a tenant cannot prevent the wasteful or extravagant use of gas for illumination on account of the manner in which the piping is put in the building.

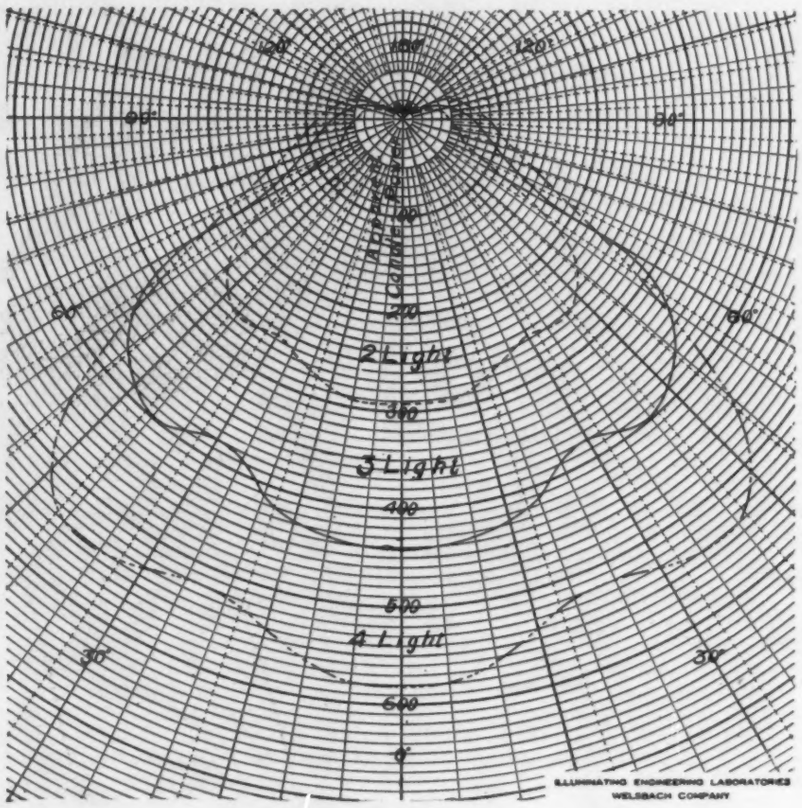
On the other hand, the knowledge and application of the simple and common sense principles of the distribution of light would often result in a material saving in lighting expense. If the consumer can be brought to give more attention to recent developments in lighting appliances, more attention to the cost of installation and operation, and more attention to the

[1]Paper read before 17th Annual Convention Pacific Coast Gas Association, San Francisco, September 21, 22, 23, 1909.

effective distribution of the light itself, we can minimize his lighting expense and enormously improve his lighting results.

This necessity has created the illuminating engineer. In going about his work, the illuminating engineer, among other things would consider the intensity of the illumination, according to the character of work to be carried out; the color value of the light; size of the units; location of units; decorative features; special lighting effects and cost of installation, including cost of operation and maintenance.

The luminous intensity of a source of light is expressed in candlepower. This unit is reproduced from specifications or by comparison with the standards maintained at the National Bureau of Standards at Washington, D. C. This unit of intensity represents equivalent candlepower and should not be conceived to represent a quantity of light or associated in any way with distance. The illuminating engineer usually expresses his illumination values in foot candles. A foot candle is the normal illumination given by one standard candle at a distance of one foot or the normal illumination on a surface, at a distance of five feet from a lamp giving 25 candlepower in the direction in which it was measured as the intensity of light varies inversely with the square of the distance.



Curves of Light Distribution and Candlepower of 2, 3 and 4-Light Reflexoliers.

The following general table of lighting values are accepted for these classes of installation:

General stores	1 to 3 ft. candles
Drygoods stores	4 to 7 ft. candles
Clothing stores	4 to 7 ft. candles
Window lighting	10 to 20 ft. candles
Reading rooms	3 ft. candles
Residences	1 to 3 ft. candles
Detail work tables	5 to 15 ft. candles

Both upright and inverted lights can be used to advantage in effective gas lighting. Each, in a measure, has a field of its own, but when you consider the many kinds of glassware and reflectors now on the market, you can readily see that the distribution of light may be so controlled and modified that equally satisfactory results may be obtained with either type of lamp, also the conditions may be such that a higher efficiency can be secured with individual lamps properly equipped with reflecting shades than that secured by arc lamps or cluster lamps. Practice has demonstrated, however, that a cluster of inverted burners for general store lighting, for instance, shows a net efficiency and general effect in favor of this character of light, especially when the clusters are equipped with reflectors properly designed to produce the most effective illumination. An inverted light equipped with the proper reflector, whether singly or in clusters, when properly placed, is generally recommended for store lighting. The cluster plan, however, permits of more sightly arrangement than a similar number of scattered lamps. Special attention is directed to the Reflexolier, a new inverted gas cluster fixture now available. This fixture is a a cluster of two, three, four, or six inverted lamps arranged in a specially designed pendant with a bypass cock which operates all the lights in the fixture by one pull of the chain. From the standpoint of convenience and as an effective gas-lighting proposition, the Reflexolier has never been equaled. The chart herewith shows the light distribution and candlepower curves of two-light, three-light and four-light Reflexoliers, equipped with Holophane distributing shades, No. 6321. Your attention is directed to the maximum candlepower obtained in one direction on each of these clusters

4-Light Reflexolier	581 candlepower
3-Light Reflexolier	440 candlepower
2-Light Reflexolier	295 candlepower

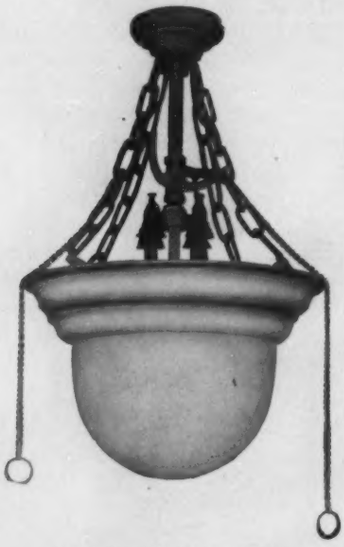
The distribution curve of the four-light Reflexolier varies less than 100 candlepower from the vertical to the 45° angle and reduces symmetrically to 240 candlepower at the 60° angle. This is conceded to be the finest distribution of artificial light ever obtained.

The following tests were made by the Electrical Testing Laboratories of New York on water gas of 20.2 candlepower, pressure 2 inches. The readings are as follows:

	Consumption.	M.S.C.P.	M.L.H.C.P.	M.Z.C.P. 0 to 60°
4-Light Reflexolier	12.6	171.5	302	472
3-Light Reflexolier	9.55	140	242	369
2-Light Reflexolier	6.37	88.6	154	239

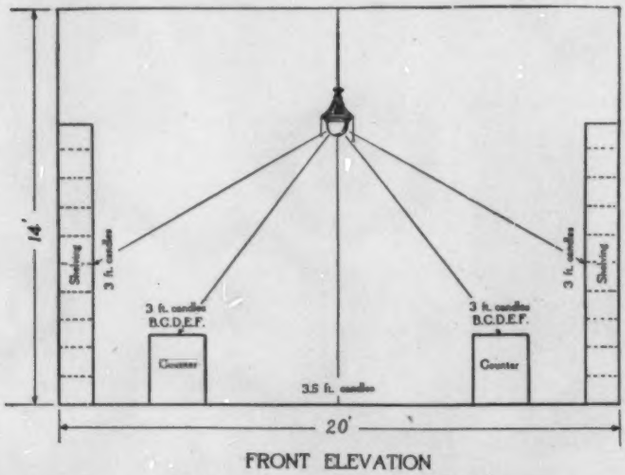
Another new device especially adapted to store lighting is the "Reflex" cluster lamp, here shown.

The "Reflex" cluster lamp is the logical successor to the upright gas arc lamp. With this lamp you can give the consumer a greater and more satisfactory illumination in the lower hemisphere at a decrease of about 30 per cent in consumption of gas. The "Reflex" cluster lamp can also be suspended closer to the ceiling than any other gas lamp ever constructed. The total length of the lamp over all is 23 inches and it can be attached close to the ceiling, if so desired.



"Reflex" Cluster Lamp.

The heat from a cluster lamp is at least 30 per cent less than the heat from the upright gas arc. This lamp, therefore, can be used with great comfort and satisfaction in places where it would not be possible to use the upright arc lamp. The distance from the floor at which this lamp should be suspended to get best results, can be varied from eight to twelve feet. The distance between the lamps should be about one and a half times the height. Where several cluster lamps are



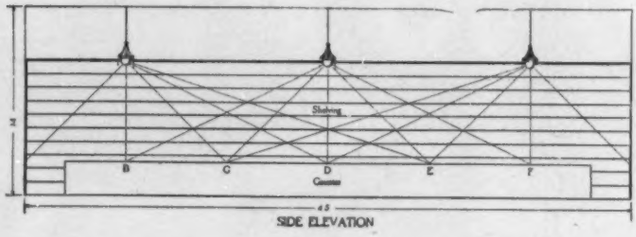
FRONT ELEVATION

used, the actual heights and distances are not so important so long as the distances are equal or nearly so and the heights not less than ten feet from the floor to the center of mantles. For general store illumination these clusters should not be spaced at a greater distance than fifteen feet apart. The accompanying illustration shows a store twenty feet wide, forty-five feet long and fourteen feet high in which are two counters three feet high. In this store three "Reflex" clusters suspended ten feet from the floor and fifteen feet apart will give a satisfactory uniform illumination on the counters, at the points B, C, D, E and F. The illumination is uniform with an average value of three foot candles.

One of the principal points in effective gas lighting is the maintenance of lights. Obviously, if this is left to the customer, it will be more or less neglected. The "Reflex" cluster lamp requires much less attention and renewals of parts and mantles, and is more adaptable to various gas conditions and wide ranges of pressure than any other lamp.

The advantage of effective window lighting is an item which at the present time the retail dealer cannot afford to overlook. His window furnishes the passing public with not only a view of the goods shown but advertises the establishment and enables them to judge for themselves in regard to his wares, and therefore he is quick to see the importance of having his window attractively lighted.

Windows can be just as satisfactorily lighted by incandescent gas lights as by any other medium. We have first to determine from the height and depth of the window the factors for the proper degree angle reflector to be used. Then the lights should be hung as close to the front of the window as possible and the light directed downward and towards the back of the



SIDE ELEVATION

window. The question of intensity required is governed by the cost and local conditions. You can readily introduce just as many lights as are required to produce a desired intensity, proper attention being given to the spacing and to the reflectors used. The use of angle reflectors with the inverted gas lamp is especially desirable for show window lighting. Reflectors can be had varying from the horizontal to a 50° section.

There are several methods of window lighting. Another may be mentioned where the inverted lamp is used to advantage with a No. 6321 Holophane shade; in this case for a sealed window. Many windows are sealed in order to protect the articles on display from the dust. In this kind of installation panels in the wooden deck are replaced by ground or clear glass panels and the light is directed down through the glass on to the goods immediately beneath or within an angle of 60° from the vertical below the lamps with sufficient brilliancy and diffusion of the light to display the goods effectively.

A "Reflex" cluster lamp may be very effectively suspended through a wood panel decked window in such a manner as to permit the heat to escape above the panels. The aperture through which the lamp is

suspended and on which it rests is usually encircled with a metal flange. An illustration of this method of installation is given herewith, showing the use of a special angle reflector. In the foregoing methods all lamps are fastened to swing joints, which permit of trimming the lamps without disturbing the window.

Window lights may be equipped with distance lighting schemes of various kinds. When using the "Reflex" cluster lamp it is necessary merely to remove the chains and attach a spiral spring to one side of the cock lever. A wire may then be attached to the opposite side of the cock lever and carried to a convenient point, and by means of a pulley, the gas may be turned on or off by simply pulling the wire and fastening it in position as long as the lamp may be in use. To extinguish the lamp it is merely necessary to release the wire. A simple pilot is used for ignition.

An independent pilot system can be often used to advantage. If it is desired to turn the lights out at a predetermined time, an automatic shut-off can be attached to a clock and, requiring no watchman, successfully guards against neglect.

There is also the method previously mentioned for distance lighting by the electric jump-spark system. Each inverted lamp is equipped with a "Reflex" sparker, designed to be placed in the burner in such a position as to insure positive and instant ignition of the gas. This system depends for its operation upon the principles now successfully used for igniting the gas mixture in automobiles and gas engines. The sparker is connected to the secondary terminals of a small induction coil. The primary current is supplied by standard dry cells. If a window deck is to be made especially for the installation of inverted lamps, attention should be given to the size and the position of the panels based upon the number of lights necessary to produce the desired intensity of light upon the goods on display. The same lamps and equipment are quite as effective in an open window as in a sealed window.

Too much stress cannot be laid on the special maintenance of lights. The gas companies have a condition here that can be turned to their distinct advantage. In rendering this service you can keep in closer touch with your consumers, and while selling illumination are assuredly selling more gas. We should look somewhat into the conditions of our customer's service and see that his outlets are in the proper place and fitted for the best arrangement of today. We are more often prone to feel satisfied with the results of past achievements than to look over the territory and realize its undeveloped condition. Selling satisfactory illumination is more important than selling gas by the cubic foot or burners by the dozen. It seems to me that this policy will naturally result in more gas sales and more burner sales.

Greater success is found in rendering the best service possible to all customers, regardless of the size of their order. We all recognize the policy that there is a strong connection between sales and service. Good service generally produces sales and, where maintenance of incandescent gas lights gives more satisfactory illumination, the chances are all in favor of the customer using more gas and finding a greater comfort in its use. Glassware and accessories cleaned regularly show an increase in average illumination of 10 to 30 per cent.

The consumer who has purchased cheap mantles and burners and attached them without any special attention to outlet arrangement, distribution of light, character of glassware, pressure and adjustment, or the purpose for which the light is required is not getting effective results. We have often seen inverted burners used where upright burners would give a better distribution, or attached to a side bracket where the proper unit would have been an upright burner with artistic glassware, attached to a central fixture, in harmony with the general treatment of the room and result in a pleasing and satisfactory arrangement to the eye. It would appear that if we would do our duty today, we should in some measure at least be illuminating engineers. A definition of an illuminating engineer has been given as: "A gas engineer with common sense."

Our salesmen should be taught to know the difference between good lighting and bad lighting. Attention to these points by the gas company would mean satisfactory sales and increasing business. To the

"Reflex" Lamp With Holophane Shade.

manufacturers of appliances it would mean sales by the hundreds where formerly great diligence was required to sell a single piece. To the public it would mean a higher and better standard of illumination. I have seen it recently suggested that a gas company appoint a member of the new business department who has some practical experience in lighting to take charge of illuminating problems. The writer also said that while they will find that they are helping the consumer, they are to a greater extent helping themselves and have opened up a line which will show returns beyond that of any other outlet for gas sales. A bright member of the new business department, as stated above, can in a very short time design installations which will be vastly better than those laid out by our most experienced fitter who relies upon experience only. The manufacturers of lamps and accessories are supplying illuminating engineering data of a character which a gas company could not compile themselves. This information can usually be secured for the asking. It is prepared in simple language and can be readily understood by the average man. A gas man who will give his attention to the effective gas lighting along these lines can increase his value many times, both to the company and to his consumers.

A WORD ABOUT GAS COLLECTIONS.

BY HOMER F. KEYES.

There has been a great deal said and written about the "gas consumer" and the relations existing between him and his natural enemy, "the company." We much-abused gas men have all agreed that it is the bounden duty of the gas company's employees to assume at all times an attitude of deference and respect toward the customer, to listen to his never-ending complaints with real interest, in fact to do all in his power to turn the dissatisfied patron into a satisfied one. As good as this bit of advice may be, it is very apt to be considered too seriously, and followed too closely, especially in the company's most important department, that of collection and adjustment.

The law we have seen demonstrated in the physical laboratory, known as the "parallelogram of forces," teaches us that an object acted upon by exterior forces invariably follows the line of least resistance. How well this rule may be applied to life, and particularly to the life of the man who has an incessant stream of complaint pouring upon him! And who can better be classed in this category than the manager of the gas company who, as the court of last resort, must stand behind the meter manufacturer whose products are keyed up to triple speed, behind the meter reader who never makes correct observations, and lastly behind the accountants, who, as all consumers know, have become so proficient in the juggling of figures that they can transform a dollar bill into one four or five times that amount without the keenest eye in the land being able to detect the fact.

The average man in this position would feel, and does feel, a decided inclination after listening to the innumerable "tales of woe" to reduce the bill about which there is a dispute, to be lax with collection on the account where the customer is not in the best of circumstances, in fact to pass the company's money over the counter, as a means of turning aside the angry or bitter criticism which in a great many instances "gets on the nerves" and blunts the appetite.

Although the methods of dealing with delinquent consumers are as numerous as the consumers themselves, we may ever bear in mind that by "putting the screws" on the "dead beat" we are not doing the company an injury, because this patron's friends know him, and his influence among them can work no harm to the company. Rather say we are doing the company an inestimable service, for besides getting that particular man's money, which he justly owes, we are teaching him that his methods "don't go"—and this he will tell his friends (who are probably of the same ilk), and a vast number of undesirable patrons are thus kept from feeding freely at the company's trough.

Promptness is an element which contributes greatly to the successful handling of gas accounts. We in Sacramento send our bills out with the "shut-off men," and expect immediate payment upon same, except in the case where the customer is a well known member of the community. In the case of consumers who are using gas, but who fall behind in their payments so that they are more than two months in arrears, we have a stock notice which we send them to "tickle" their memory and to hasten payment. If they fail to settle within the next month we send a stronger notice, one which suggests disconnection in the event of continued delinquency. After a specified time if payment has not been made, the consumer's meter is disconnected and his ledger card is removed from the "consumers' drawer" and placed in a separate compartment among the accounts of consumers who for any reason are no longer customers of the company. These cards, being separate from those of current consumers, may be handled with especial care, and at the same time the "current ledger drawer" is not blocked with dead accounts, which cause trouble and confusion to the accountant in making out the regular monthly bills.

We classify them as those of our non-consumers and of course handle them in an altogether different manner from the accounts of our regular current consumers. Sets of metallic date tabs, which are readily attached to the cards, make it possible to keep these accounts, together with what correspondence has arisen concerning same, or whatever general information has been gathered, ever at the finger-tips. If the consumer repeatedly refuses payment of a just indebtedness, his card goes into a separate file marked "Given to Collector" and a law and collection agency handles the payments after that. If the customer leaves the city and cannot be located we place his card in a drawer marked "black list," and there in the great majority of cases it lies until time has obliterated the markings thereon or fresher accounts have forced it into the waste basket.

ELECTRIC POWER IN GERMANY.

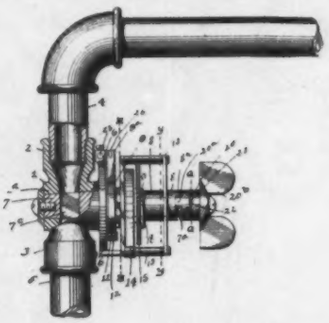
The problem of utilizing the public water power of Bavaria for the purpose of converting it into electricity and turning it to account in this way for manufactures and railway traction has been much discussed during the past three or four years. The question is of special importance to Bavaria, as the chief part of the country has no large coal mines of its own and no cheap means of transporting coal from the mining districts of central and western Germany. In central Bavaria railway coal costs about $5.70 per ton, of which $1.65 to $3.30 is paid for transportation. On the other hand, water power converted into electric force is supposed to cost 1 to 2 pfennigs (about ¼ to ½ cent) per kilowatt hour. The principal object of the utilization of water power in Bavaria for conversion into electricity is twofold.

First, the manufacture of a substitute for Chile saltpeter or nitrates. After long experiments, Professor Frank in Charlottenburg, and Doctor Caro have discovered a process through which, by combining the nitrogen of the atmosphere, calcium cyanide is obtained, which is looked upon as a substitute for Chile saltpeter.

Second, the use of electricity for railway traction. Here the chief difficulty is to be found in the varying requirements of railway traffic for traction force. This difficulty can be obviated by constructing, on the one hand, artificial water basins which are to furnish the additional power needed at certain seasons of the year and, on the other hand, special basins which are to furnish the extra force required on single occasions. Another difficulty lies in the fact that all open water basins, as well as rivers, are subject to freezing in winter, so that the traffic may be impeded.

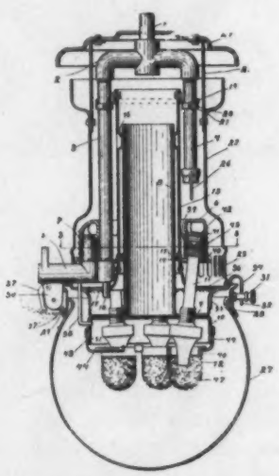
PATENTS

933,153. Automatically-Controlled Gas-Valve. George M. Bierly, Columbus, Ohio. In a device of the character described, the combination with a valve casing, a rotary valve therein having a stem, a sleeve on said stem, and a clock mechanism comprising a spring, one end of which is affixed to said sleeve, of a slidable thermostat member formed of readily expansible metal, means for turning said valve stem



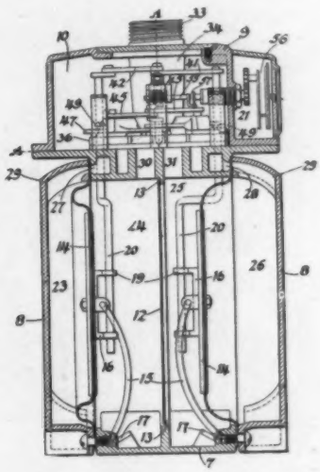
and its sleeve by hand, connections between said thermostat member and the valve stem, means for holding the thermostat member rigid when expanded, means for locking the valve stem in an open position until the thermostat member is expanded, and means connected with the valve stem sleeve for releasing said valve stem after the thermostat member is expanded by operation of the clock mechanism.

933,177. Gas-Lamp. Alfred H. Humphrey, New York, N. Y., and Frederick J. Humphrey and Reginald Wright, Kalamazoo, Mich., assignors to General Gas Light Company, Kalamazoo, Mich. In a gas lamp, the combination with a gas delivery pipe comprising a T-coupling with depending arms, of a chimney having an outwardly-projecting deflector flange at its lower end; a chimney casing having an outwardly-projecting flange at its lower end, secured to said chimney in a



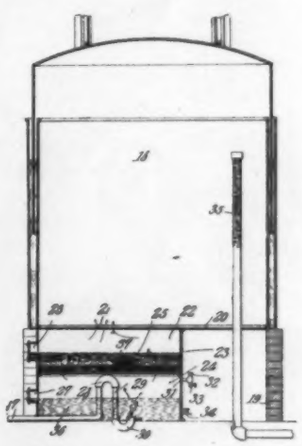
spaced relation thereto; a flange-like supporting member arranged to embrace and secured to said chimney casing, said member having openings therein through which said arms are arranged; and burners comprising burner tubes and tips arranged through said flange of said chimney and through said flange of said chimney casing with their tips below said flange of said chimney; an outer casing; and a deflector arranged above said coupling of said gas delivery pipe.

933,159. Gas-Meter. Horace Chrisman, Edgewood Park, Pa., assignor to Pittsburg Meter Company. In a gas meter, a body portion, a top cover and two side covers secured thereto, a stationary partition located within said body portion between said side covers, a reciprocating diaphragm located between each side cover and said body portion and forming with said stationary partition four measuring chambers, a distributing chamber located within said top cover, a gas delivery port formed within said cover and communicating with



said chamber, an exhaust chamber located between said measuring chambers and said distributing chamber, passages provided in said body portion for establishing communication between said measuring, said exhaust and said distributing chambers, two valves located within said distributing chamber for controlling the delivery of gas through said passages, a flag wire secured to each diaphragm and extending upwardly through said body portion into said distributing chamber for operating said valves and an exhaust port provided in said top cover and communicating with said exhaust chamber.

933,097. Apparatus for Purifying Gas. William McArthur, Tenino, Wash. An apparatus for purifying gas contain-



ing lime in a semi-liquid state and beyond the same in the path of the gas having a support containing coke, sawdust and lime.

JOURNAL OF ELECTRICITY
POWER AND GAS
PUBLISHED WEEKLY BY THE
Technical Publishing Company
E. B. STRONG, President
A. H. HALLORAN, Secretary and Managing Editor
DIRECTORS
R. J. DAVIS A. M. HUNT E. M. SCRIBNER C. L. CORY E. B. STRONG
604 MISSION STREET, SAN FRANCISCO

TELEPHONE - - - - - - - - - KEARNY 918

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year.	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	5.00
Single Copies, Current Month	each	.10
Single Copies, prior to Current Month	"	.25

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

FOUNDED 1897 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

CONTENTS

President's Address, Pacific Coast Gas Association 271
By W. B. Cline.
Methods of Education of Consumers 273
By Wm. Baurhyte.
The Port Huron Decision 274
Gas Distribution in San Francisco 275
By W. R. Morgan.
Effective Gas Lighting 280
By B. J. Thompson.
A Word About Gas Collections 284
By T. F. Keyes.
Electricity in Germany 284
Patents 285
Editorial 286
The Pacific Gas Man.
Tactful Service.
Electrical Engineers' Banquet 287
Los Angeles Section A. I. E. E. 287
Pacific Coast Gas Association Banquet 287
Journal Portraits 288
Paul M. Downing.
New Catalogues 288
Personals 288
Trade Notes 288
News of the Stationary Engineers 289
San Francisco No. 1.
N. A. S. E. Club.
The Electric Storage Battery 289
By O. W. Lillard.
Questions and Answers, Pacific Coast Electric Vehicle Association 291
Industrial 292
Westinghouse Exhibit of Electric Heating Apparatus.
Intensified Arc Lamp.
Pole Yard of Kellogg Switchboard and Supply Co.
Novel Use of Gas Engines.
A Storage Battery Installation.
News Notes 295

The Pacific Gas Man

Pacific in deed as in name, the gas man invaded San Francisco this week in an annual convention. The meetings were the largest and most enthusiastic yet held and reflected great credit upon the representatives of Secretary John A. Britton who was unavoidably absent. The papers read, while on the whole interesting, contained but few novel points. In such a progressive industry as this, each successive year sees some new saving, small in itself, but in the aggregate tending to greater economy. Of this, the most notable is the utilization of the carbon residuum from the manufacture of oil gas, hitherto an unwelcome waste product, baffling efficient recovery. Briquetting converts it into a fuel, valuable alike for domestic use or as a basis for water gas manufacture. Continued advance is also being made in the high pressure distribution of gas, which is bringing fame to the West as did the pioneer efforts in the high tension transmission of electricity. The regrettable omission this year, as in all years previous, is a detailed description of the methods and appliances used in the manufacture of gas from crude oil. This has been eagerly awaited and when it is ultimately made public will confirm the merited reputation of the western gas maker.

Tactful Service

Other things being equal service induces patronage. Aside from the excellence of the thing served, the most important essential of service is tact, that rare combination of courtesy and justice which constitutes skill in dealing with men. To define it is as difficult as to impart it. It may be observed in every successful employee of a public service corporation, for tact is as necessary to success as a knowledge of the business.

Frictionless contact with consumers is as impossible as frictionless bearings in machinery. A judicious application of tact will minimize the effects of such friction, lubricating any irritating conflict of opinion and making smooth the course of business. When used too copiously, however, in the form of "jolly" its insincerity becomes manifest and its beneficial results nullified.

A piece of grit sometimes gets into the best regulated machinery, and all the oil in the can is not as effective as a general cleaning that removes the complaint. Prompt action on legitimate complaints prevents much damage. These should not be confounded with the imaginary troubles of the chronic complainer, which like the squeak in the engine that came only with the presence of the ventriloquist, causes unnecessary trouble. The public has become educated to expect good service, whether of gas, electricity, water, telephone or transportation facilities. The first requisite in meeting this expectation is tact.

ELECTRICAL ENGINEERS BANQUET.

The San Francisco Section of the A. I. E. E. gave an informal dinner at the Old Poodle Dog Restaurant in San Francisco on Thursday, September 16. This was primarily for the purpose of welcoming Mr. Ralph W. Pope of New York, secretary of the A. I. E. E., and also Mr. Charles F. Scott, past president of the institute, and Mr. P. M. Lincoln, vice president. Ninety-nine electrical men of San Francisco and vicinity did ample justice to the excellent menu and

Mr. George R. Murphy, chairman of the local section,

Mr. George P. Murphy, chairman of the local section, made a few introductory remarks, including an announcement of the courtesy of the firm of McMeen & Miller and of the Home Telephone Company in providing a regular meeting place, and also of committees to serve during the ensuing year. He then introduced Mr. Samuel G. McMeen, "the committee on entertainment," who thereafter ably presided as toastmaster.

Doyle Photo — **Banquet San Francisco Section American Institute of Electrical Engineers**

After a few characteristic witticisms, Mr. McMeen introduced the secretary, Mr. R. W. Pope, who re-called his visits to San Francisco and traced the early history of the institute. In the course of his talk, Mr. Pope spoke of the various problems that had arisen, including particularly that of grading of membership, and also the question of technical divisions. He laid emphasis on the fact that membership of the institute means just as much in one place as in another.

Mr. Charles F. Scott spoke of the work that is now being done by the past presidents who are taking a live interest in all institute matters, even though their term of office has expired. He showed the advantages of institute membership, and laid particular stress on the benefits derived therefrom. Mr. W. W. Briggs, manager of the San Francisco office of the Westinghouse Electric & Mfg. Co., spoke of the commercial engineer. Mr. P. M. Lincoln, chairman of the Sections Committee, after a tribute to Mr. Scott, told of the activities among the various sections throughout the country. In reply to aspersions cast upon the local sections, Mr. A. H. Babcock, electrical engineer for the Southern Pacific Company, gave a strong defense. The speeches were concluded by a short address from Mr. Charles N. Black, vice president and general manager of the United Railroads of San Francisco.

Los Angeles Section of the A. I. E. E.

The Los Angeles Section of the A. I. E. E. gave an informal complimentary dinner to Mr. R. W. Pope, Wednesday, September 22d, 1909, at the Hollenbeck Hotel. There was a large enthusiastic attendance, and a number of able speeches. During the day Mr. Pope was the guest of the Pacific Electric Railway Company and the Local Section on a trolley trip over the lines of the Railway Company.

BANQUET OF PACIFIC COAST GAS ASSOCIATION.

The Pacific Coast Gas Association brought its seventeenth annual convention to a close Wednesday evening at a banquet given at the St. Francis Hotel in San Francisco. About 125 delegates were present, representing gas companies in Washington, Oregon, Nevada and California. The newly elected officers are: W. B. Cline, president; Frank A. Leach of Oakland, vice president; John A. Britton, secretary and treasurer; Henry Bostwick, assistant secretary and treasurer; Christian Froelich, F. V. T. Lee, C. F. Vance and C. A. Luckenback, directors. The next convention will be held at Los Angeles. Among the speakers Wednesday evening were E. C. Jones, L. P. Lowe, John Werrey, J. F. Parker of Illinois, H. L. Strange of Honolulu, John Martin, Frank Leach Jr. and J. M. Berkeley. Leon S. Jones was elected experience editor, and J. M. Berkeley wrinkle editor.

JOURNAL PORTRAITS

Paul M. Downing, engineer of operation and maintenance of the hydro-electric section of the Pacific Gas and Electric Company, was born at Newark, Mo., on November 27, 1873. He took the degree of B. S. from Washington College in 1891, thereafter entering Stanford University, from which he was graduated with the degree of A. B. in 1895; also becoming captain of the football team in the year of his graduation. He first entered the employ of the Tacoma Light and Power Company of Tacoma, Washington, as a dynamo tender, soon after resigning this position in 1896 to become the assistant motor inspector and power house operator of the Market Street Railway Company of San Francisco. In 1897 he became station superintendent at Blue Lakes City, California, for the Blue Lakes Water Company's power house. In 1898 he became associated with John Martin, at that time agent for

Paul M. Downing.

the Stanley Electric Manufacturing Company, in the installation and operation of electrical apparatus, especially in connection with long-distance high-voltage transmission systems, personally installing the hydro-electric plant for the Tuolumne Light and Power Company. In 1900 he became the chief electrician for the Standard Consolidated Mining Company at Bodie, California, subsequently becoming manager of the Colusa Gas and Electric Company. In 1901 he became division superintendent of the Bay Counties Power Company at San Francisco. Since 1903 he has been superintendent of the substations of the California Gas and Electric Corporation, and operating engineer of that corporation and the Pacific Gas and Electric Company. This position involves the oversight of five hundred miles of ditches and flumes; eleven hydro-electric power houses, with a total capacity of 50,000 k. w.; 800 miles of three-phase transmission lines and a hundred substations, having a total rated capacity of 90,000 kilowatts.

For this information and half tone, we are indebted to the Pacific Gas and Electric Magazine.

NEW CATALOGUES.

Bulletin No. 22 from the Coates Clipper Mfg. Co. of Worcester, Mass., illustrates and describes the Coates unit link flexible shaft.

The Electric Cable Company of Bridgeport, Conn., have issued a new price list of rubber covered and weather-proof wires and cables, and magnet, annunciator and office wire.

PERSONALS.

Henry H. Hyde, formerly of Racine, Wis., is now manager of the Tacoma Gas Company at Tacoma, Wash.

B. Hayhurst has been appointed manager of the Home Telephone Company's exchange at Oregon City, Ore.

J. C. Linabary has succeeded W. H. Evans as electrical engineer of the Stockton Electric Railroad at Stockton, Cal.

A. C. Collins, construction engineer of the Sacramento Valley Irrigation Company, was in San Francisco last week.

F. P. Bergen is now general manager of the Sacramento Valley Power Company which is extending its lines to Chico.

A large party of electrical men left San Francisco this week to attend a meeting of the Electric Jobbers' Association at Seattle.

Garnett Young, Pacific Coast manager of the Telephone-Electric Equipment Co., left San Francisco this week for the Northwest.

R. J. Davis, president of the Standard Electrical Works of San Francisco, is expected to return from the East by the end of this week.

C. B. Noyes has joined the sales engineering staff of Harron, Rickard & McCone, making a specialty of Dodge power transmission apparatus.

F. H. Woodward of the Standard Electrical Works left San Francisco on Thursday for Seattle and the Northwest by way of Klamath Hot Springs.

W. H. Evans has resigned as electrical engineer of the Stockton Electric Railroad Company to enter the electrical department of the Southern Pacific Railroad at Portland, Ore.

T. C. Martin has resigned as co-editor of the Electrical World of New York, after a quarter century's service, to become general secretary of the National Electric Light Association.

W. R. Leonard has been appointed assistant treasurer of the Everett Railway, Light & Water Company, Everett, Wash., to succeed R. E. Maxfield, resigned. Mr. Leonard was formerly connected with the Northern Texas Traction Company, Fort Worth, Texas.

Arthur E. Rowe, for six years manager of city sales dept., Electric Appliance Co., San Francisco, has resigned that position to become identified with the Telephone-Electric Equipment Co. Mr. Rowe's new position is one of prime importance in the local sales organization of the last mentioned firm.

C. Remschel, for four and one-half years sales engineer with the Seattle office of Allis-Chalmers Company, has opened offices as consulting and contracting engineer at 118 Third avenue south, Seattle, Washington. Prior to his connection with Allis-Chalmers Company, he was associated with the San Francisco office of the Westinghouse Electric & Manufacturing Company, for three years, and with the San Francisco Gas & Electric Company, for five and one-half years.

TRADE NOTES.

The United States Civil Service Commission announces an examination on October 20-21, 1909, to secure eligibles from which to make certification to fill a vacancy in the position of draftsman, $1,000 per annum, in the Patent Office, Washington, D. C., and vacancies requiring similar qualifications as they may occur.

Mr. Charles L. Kiewert of Milwaukee, has formed a new company under the laws of California, retaining the original name, but having as their controlling stockholders The Engineering and Maintenance Company of San Francisco. The directors of the new corporation are R. E. Martinez, president; E. J. Hampton, secretary, and C. H. Grundman. This company will handle the Siemen's flaming arc lamps and carbons.

NEWS OF THE STATIONARY ENGINEERS.

PREAMBLE.—This Association shall at no time be used for the furtherance of strikes, or for the purpose of interfering in any way between its members and their employers in regard to wages; recognizing the identity of interests between employer and employe, and not countenancing any project or enterprise that will interfere with perfect harmony between them.

Neither shall it be used for political or religious purposes. Its meetings shall be devoted to the business of the Association, and at all times preference shall be given to the education of engineers, and to securing the enactment of engineers' license laws in order to prevent the destruction of life and property in the generation and transmission of steam as a motive power.

California.

No. 1. San Francisco. Thursday, Central Hall, 124 Fulton St. Pres., A. C. Arbuckle. Sec., Herman Noethig, 900 York St.

No. 2. Los Angeles. Friday, Eagles' Hall, 116½ E. Third St. Pres., Gabriel Allen. Fin. Sec., Harry Notthoff, 1307 Winfield St. Cor. Sec., W. T. W. Curl, 4103 Dalton Ave.

No. 3. San Francisco. Wednesday, Merchants' Exchange Bldg. Sec., David Thomas, 914 O'Farrell St.

No. 5. Santa Barbara. Geo. W. Stevens, 2417 Fletcher Ave., R. R. No. 2.

No. 6. San Jose. Wednesday. Pres., W. S. Pierson. Sec., Leal Davis, 350 N. 9th St.

No. 7. Fresno. Pres., J. F. Wagoner. Sec., F. J. Whitney, Box 8.

No. 8. Stockton. Thursday, Masonic Hall. Sec., S. Bunch, 626 E. Channel St. Pres., Jos. Gieger.

Oregon.

No. 1. Portland. Wednesday, J. D. Asher, Portland Hotel. Pres., O. H. Reed.

No. 2. Salem. A. L. Brown, Box 166.

Washington.

No. 2. Tacoma. Friday, 913½ Tacoma Ave. Pres., Geo. E. Bowman. Sec., Thos. L. Keeley, 3727 Ferdinand St., N., Whitworth Sta.

No. 4. Spokane. Tuesday. Pres., Grant Tuttle. Sec., J. Thos. Greeley, 0601½ Cincinnati St.

No. 6. Seattle. Saturday, 1420 2d Ave. Pres., J. H. Beckman. Sec., J. C. Miller, 1600 Yesler Way.

Practical letters from engineers and news items of general interest are always welcome. Write your items regardless of style. Communications should be addressed to the Steam Engineering Editor.

SAN FRANCISCO No. 1, N. A. S. E.

San Francisco No. 1. N. A. S. E., had a large attendance at their last meeting and initiated three candidates, besides receiving two applications for membership. The Educational Committee has arranged for a lecture on Alternating Current and its various applications by Mr. Arthur Jordon, vice principal of the Polytechnic High School, which will be augmented by the apparatus which he will make use of during his lecture, and no doubt will be of much interest and enlightenment to those present. The committee announced that they have also provided for other lectures on various subjects, which will probably take up the attention of the members for at least five consecutive meetings.

The N. A. S. E. Club of San Francisco.

A new club known as the N. A. S. E. Club of San Francisco, was organized by the old and discharged Sixth Annual Joint State Convention Committee, to which only the members of that committee and Past Presidents John W. Maher of No. 1 and W. P. Millner of No. 3, and the Past State President H. D. Saville of the State Association, are admitted as members. The purpose of this club is, first: that the members of the Joint State Convention be unofficially held together, just for old times sake and also to suggest to each Association in an informal way of constantly keeping the National Association of Stationary Engineers of San Francisco before the public by formulating plans for anything that might benefit both associations in their educational, social and financial undertakings. There are 17 members in the club and they will meet every first Tuesday in each month; after the session is over they will endeavor to entertain themselves in some unique way in some nearby theater or cafe. P. L. Ennor is chairman, Chas. Dick, treasurer, and H. W. Noethig, 816 York street, secretary pro tem.

THE STORAGE BATTERY IN THE ISOLATED LIGHTING PLANT.[1]

BY O. W. LILLARD.

It is commonly known that the Storage Battery stores electrical energy, but how it stores it, how it gives it out, what are its uses and what it can do are probably questions that you have had in your minds. Technically a storage battery stores electricity by storing chemical energy. There have been a great many chemical compounds used for this, but the only ones that have proved practicable are a combination of lead and lead oxides in an electrolyte or bath of dilute sulphuric acid. In the lead storage battery, as in the primary battery, there are two elements, positive and negative. The part of the positive element which does the work (called the active material) is lead peroxide. The active material of the negative element is pure spongy lead. These materials furnish electricity in exactly the same way as the primary battery, but they possess this peculiar property, that when they are exhausted it is possible to recharge them by passing a current of electricity through them in the opposite direction of the discharge, and are then in a condition to discharge again. These operations may be continued almost indefinitely, the only limit being the life of the elements. In laboratory work, in excess of three thousand discharges are obtained before the battery is worn out. The positive elements wear out much more rapidly than the negative. In fact, some types of negative elements seem to have practically an unlimited life. The life of the positive element in ordinary use is usually taken at from five to ten years, depending on its weight, method of manufacture and use. The negative element under the same conditions, will last from seven to twenty-five or thirty years, possibly longer. As the positive element, as a rule, is only about from one-third to one-half of the total cost of the battery, it is seen that the depreciation on storage batteries cannot be very high. For convenience in manufacturing, the elements, both positive and negative, are usually made up of a number of plates, and there is almost always one more negative plate than positive. These plates are placed in the cell, alternately positive and negative; all the positive plates being electrically connected together, and all the negatives. The positive plates are protected from contact with the negative plates by separators of various materials; glass, rubber, porous clay or porcelain, fibre, and a number of other materials having been used. These have all, however, been replaced within the last five or six years by treated wood veneer, which is the cheapest and at the same time the most satisfactory separator.

You are probably aware that the storage battery is heavy, bulky and expensive. For its weight, size and cost, it strikes one, unfamiliar with it, to have an astonishingly small amount of stored energy. This is true to a certain extent. At the same time a storage battery of ordinary construction has sufficient stored energy in it to lift its own weight from five to eight miles in the air, and a storage battery constructed with a view of lightness contains sufficient energy to lift itself to at least fifteen miles.

One of the principal uses of storage batteries is regulating fluctuations of load. We are all familiar with the use of the fly-wheel for this purpose, which it accomplishes admirably when the fluctuations are not heavy or long sustained. Some figures on the comparative weights and efficiencies of the storage battery and the fly-wheel in this connection may be interesting, and in order to make the comparison, we will suppose heavy fluctuations, but not heavier than daily occur in, for instance, an electric power plant where electric elevators are operated. In one such plant in this city, with an average load of about fifty k. w. there frequently occur fluctuations of 100 to 150 k. w., lasting for several seconds. These fluctuations could be taken care of by a storage battery weighing in the neighborhood of twenty thousand

[1]Paper read before California No. 3, N. A. S. E.

pounds. To obtain the same regulation, a fly-wheel rotating at one hundred and twenty revolutions a minute would have to weigh between one hundred and fifty thousand and two hundred thousand pounds. This, of course, would be absolutely absurd and would take up much more room and cost considerably more than the equivalent storage battery. If these fluctuations instead of lasting three seconds lasted thirty, the fly-wheel would have to be so much larger that I hate to strain your credulity. The battery, however, would carry such an overload for fifteen minutes.

One of the uses of storage batteries is the so-called "stand-by" service. In this use the storage batteries are connected in parallel with the generators. In case of any trouble with these, the battery instantly takes up the load and carries it until another generator can be put into service. Of course, in an office building, for instance, the battery can be called upon to carry the entire night load after the generators are shut down. Stand-by batteries have a very extensive development in the electric lighting companies of large cities, and particularly where they are dependent on water power and long distance transmission lines. In Los Angeles, for instance, the Edison Company, which derives the bulk of its power from the Kern River plants, has two large storage batteries. They experience trouble with their transmission lines, due to shorts, etc., on an average of two or three times a month. On these occasions the storage battery steps in and continues their service until their alternate line can be put in operation. With a storage battery, under such conditions, there is no interruption of the service. Without a storage battery it might be half an hour before the alternate line could be started, as it would be necessary to start up and synchronise all of their machinery before the load could be taken up. Auxiliary steam generating plants are sometimes used for this ermegency service, but the objection to these is that it takes a considerable time to get up the required steam pressure in all the boilers, as would be the case during heavy load conditions, while the storage battery is automatically and instantly available.

The largest application of storage batteries, however, is for regulation purposes. The ideal condition for a power plant is an absolutely, steady full load during the entire time the plant is running. Under these conditions alone can can a high efficiency be obtained. Unfortunately these conditions almost never obtain. In a great many plants, however, the fluctuations are not very heavy and are often so gradual that they can be taken care of by starting up or shutting down additional units. In these cases, of course, a storage battery is not needed. When, however, we have a heavy, fluctuating load, fluctuating violently and rapidly, there is nothing that can alleviate this condition but a storage battery. This fluctuating load occurs—to use the most familiar instances—where electric elevators or hoists are used, and, in the case of electric inter-urban railroads, on which there are few trains or cars. The load fluctuates from zero to three or four times the average load, every few seconds, and this performance is kept up indefinitely. The fluctuations are so violent and rapid, that the governor of the steam engine cannot keep up with them. The engines are constantly pounding and the voltage of the system is unsteady. As the engines are running either at practically no load or at a heavy overload all of the time, their efficiency is very low. A storage battery regulating installation, alleviates all of these conditions by absorbing all the fluctuations above and below the average. The load on the generators is reduced to the average load and kept at that point with in five per cent, under extreme conditions. By reducing the generator load to the average load on the plant, instead of a maximum of several times this, it is usually possible to shut down half the generators. In some cases one small generator will carry the load at all times where it was formerly necessary to run two large ones, the greater part of the time. Due to the fact that the load is maintained constant on the generator, the voltage of the system is absolutely constant, a variation of a quarter to a half per cent in voltage being the maximum obtained. The battery, of course, takes all shock, due to fluctuations, from the engines and enables them to run steadily and quietly at their point of highest efficiency; and with the least possible liability to accident. As the engine is running at its most efficient point, a large saving of fuel is obtained. In exceptional cases this may be as high as fifty or sixty per cent, and it usually exceeds thirty. Another advantage, which is not usually given full consideration, is the fact that the whole plant is running under absolutely steady conditions and similar to those used by experts when testing the installation. Under these ideal conditions it is easier to study the operation of each part of the plant, and tune it up to its best possible performance. In addition to the saving of fuel above mentioned, in the case of an office building the steam plant may be shut down at about nine o'clock at night and the load carried by the storage battery. This effects a further saving, especially when power for this purpose is being purchased from the electric lighting companies.

The method by which this regulation is obtained is shown by the elementary diagram.

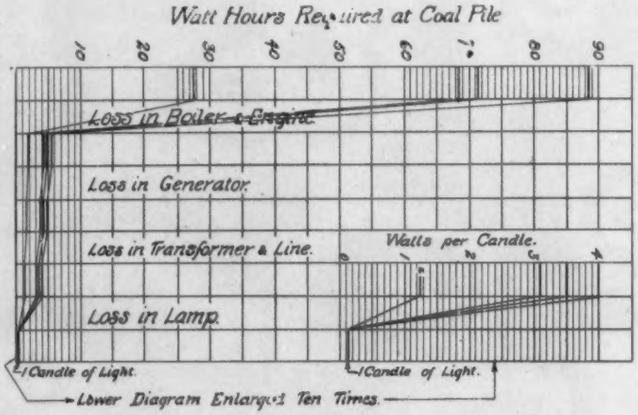

Watt Hours Required at Coal Pile
Loss in Boiler & Engine.
Loss in Generator.
Loss in Transformer & Line.
Loss in Lamp.
Watts per Candle.
1 Candle of Light.
1 Candle of Light.
Lower Diagram Enlarged Ten Times.

Diagram of Connections.

In this diagram G represents the generating plant, M, C, and B are the motor, "counter," machine and booster of the regulating set, which are connected on the same shaft. It is noted that the battery is in parallel with the line, and in series with the booster. Also that the booster field is in series with the "counter armature and in opposition to the line voltage. Neglecting the shunts, the field of the counter machine S carries the load on the generator. For example, presuming this load is 100 amperes, the counter machine is so designed that its voltage equals the line voltage when the field has the hundred amperes passing through it. Under those conditions there will be no current flowing through the counter machine armature or through the booster field, and, consequently, the battery will neither charge or discharge. Presume that on account of a heavy overload the load on the generator should increase to 105 amperes, that is to say five per cent. The voltage of the counter machine would also increase five per cent and the current would flow through the booster field, determined by the resistance of the circuit. This resistance is so designed that under these conditions the booster would be excited to its maximum voltage to discharge the battery, and the battery would be discharging at its highest rated capacity. It is seen, then, that an increase of the load on the generator of five per cent would make the battery discharge its maximum rate. Similarly a decrease of the load on the generator would correspond to the condition of the battery charging at its highest rate. Transposing this statement the result is that the load cannot vary more than five per cent

on the generator unless the battery charge or discharge is in excess of its rated capacity. Stated more simply, this system of regulation maintains the load constant on the generator within five per cent under any conditions of fluctuations which are in the range the battery was designed for. By means of the shunts across the counter field "S" the load on the generator may be increased by regular steps to any amount, and in this way the generator load may be set to correspond to the average load on the plant. No matter for what load the generator is set, the regulation is maintained within five per cent. It is understood, of course, that this is an elementary diagram. In operation a number of minor additions are made in order to increase the efficiency and insure the reliability of this method of regulation.

The storage battery, of course, lends itself most readily to the regulation of direct current plants, but the fluctuating load condition occurs as often in alternating current plants as it does in direct. The Gould Storage Battery Company has developed within the last four or five years the first practical system of alternating current regulation by means of storage batteries and has a number of these plants in successful operation. The theory of this regulation is very similar to that of the direct current system, and while very interesting from an engineering point of view, it would take too much of our time to go into it extensively.

Another interesting application of storage batteries is in competition with primary batteries, where facilities for recharging the storage battery exist. You are, of course, familiar with the fact that the telegraph companies at one time operated their lines from primary batteries. Now they use storage batteries exclusively. The storage battery is many times lighter and more compact than the primary battery. Its first cost is about the same, and while a storage battery in this use will last from five to eight years without renewals, a primary battery under the same conditions requires renewals every few months. The policy of the telephone companies has been the same as that of the telegraph companies.

In general it may be stated that a storage battery will more than save its cost, in a year's time, in competition with a primary battery. Of course, it is understood that there must be sufficient use of current to make the installation worth while. It is interesting to note, however, that in the new large hotels, etc., a storage battery is used in preference to primary batteries for operating fire alarm systems, call bells, interior telephones, etc. The storage battery is more reliable, and in addition to taking up less room, it requires less attention.

While I have covered the principal uses of the storage battery with which you might come in contact, an outline of the other uses might be of interest. A very large use in connection with the electric lighting of cars on steam railroads. This may not seem a large use until you stop to consider the number of cars so equipped and the fact that the storage battery equipment for each car will run from five hundred to one thousand dollars. You will have seen and admired the electric automobile propelled by storage batteries. This is a fast growing branch and will probably reach high development in the next few years. I do not have to tell you that the electric automobile is noiseless and practically fool-proof. It may, however, astonish you to know that it is considerably faster than the highest powered gasolene car for travelling in crowded city streets.

Small portable storage batteries are largely used for ignition purposes in stationary, automobile and motor-boat engines, and in this service stand a wonderful amount of abuse and use. Storage batteries are also used for operating railway and other signals, by the telegraph and telephone companies, as an adjunct to gasolene and electric lighting plants for residences, for experimental purposes (where its steady flow and constant voltage is invaluable), and for a great number of other comparatively unimportant uses.

QUESTIONS AND ANSWERS.

Pacific Coast Electric Vehicle Association.

Question 4. When will a battery require its first cleaning?

Answer 4. A cell should always be cleaned when the sediment has arisen to within ¼-inch of the top of the rib of the jar, or the bottom of the plates. The time it will take for the sediment to accumulate to this extent is entirely dependent on the service the battery is called upon to perform. Assuming that the rib of the jar is (1¾ inches) high, the sediment should be removed when it has reached a height of 1½ inches.

If at the end of 50 charges, the sediment is ½-inch deep, at the same rate of deposit the depth would be 1½ inches deep at the end of 150 charges. As the rate of deposit increases with age, it is necessary to make an allowance of about 20 per cent and the battery should be cleaned at the end of 120 charges.

If at the end of 50 charges, ¾ inches of sediment has accumulated making the same allowance, 1½ inches of sediment would be accumulated at the end of 80 charges.

Question 5. What is the best method to pursue in cleaning a battery?

Answer 5. When it was determined by careful inspection that the sediment has reached a point where it is within ¼-inch of the bottom of the plates, cleaning should not be delayed. The battery should be fully charged and all the cells disconnected. The best method of disconnecting cells where the pillar straps are used, is to use a ⅝-inch twist drill in a carpenter's brace, boring down into the top of the pillar about ¼-inch. The connector sleeve can then be easily removed from the pillar. When the cells are equipped with top straps, the straps should be cut with a sharp knife or chisel midway between the cells, or another very easy way is to use an ordinary hacksaw.

Care should then be taken to unseal the jars properly and for this purpose a hot putty knife will remove the sealing compound very quickly

Remove the elements from the jars, placing each on its side with the plates vertical; remove the separators and play a gentle stream of water on the plates. Care should be taken not to use water with considerable pressure as this would simply wash out the active material needlessly. All broken or cracked wood separators should be replaced with new ones. In fact, it is far preferable to install a complete set of new wood separators. If an extra jar is at hand, the work can be facilitated by pouring the electrolyte from the cell dismantled into the extra receptacle taking care not to stir up the sediment. The sediment can then be easily washed out and the elements replaced, covering with electrolyte immediately so that the plates do not get a chance to dry out. If new wood separators are put in, the gravity of the electrolyte used for re-filling should be 40 points higher than when the cell was taken out to counteract the lowering of the gravity due to the water in the separators.

After this method has been followed for all the cells, replace the hard rubber covers, place the cells in the trays and after the polarities are correct, reburn the connections and seal the cells. The battery should then be fully charged and the electrolyte adjusted to its proper specific gravity.

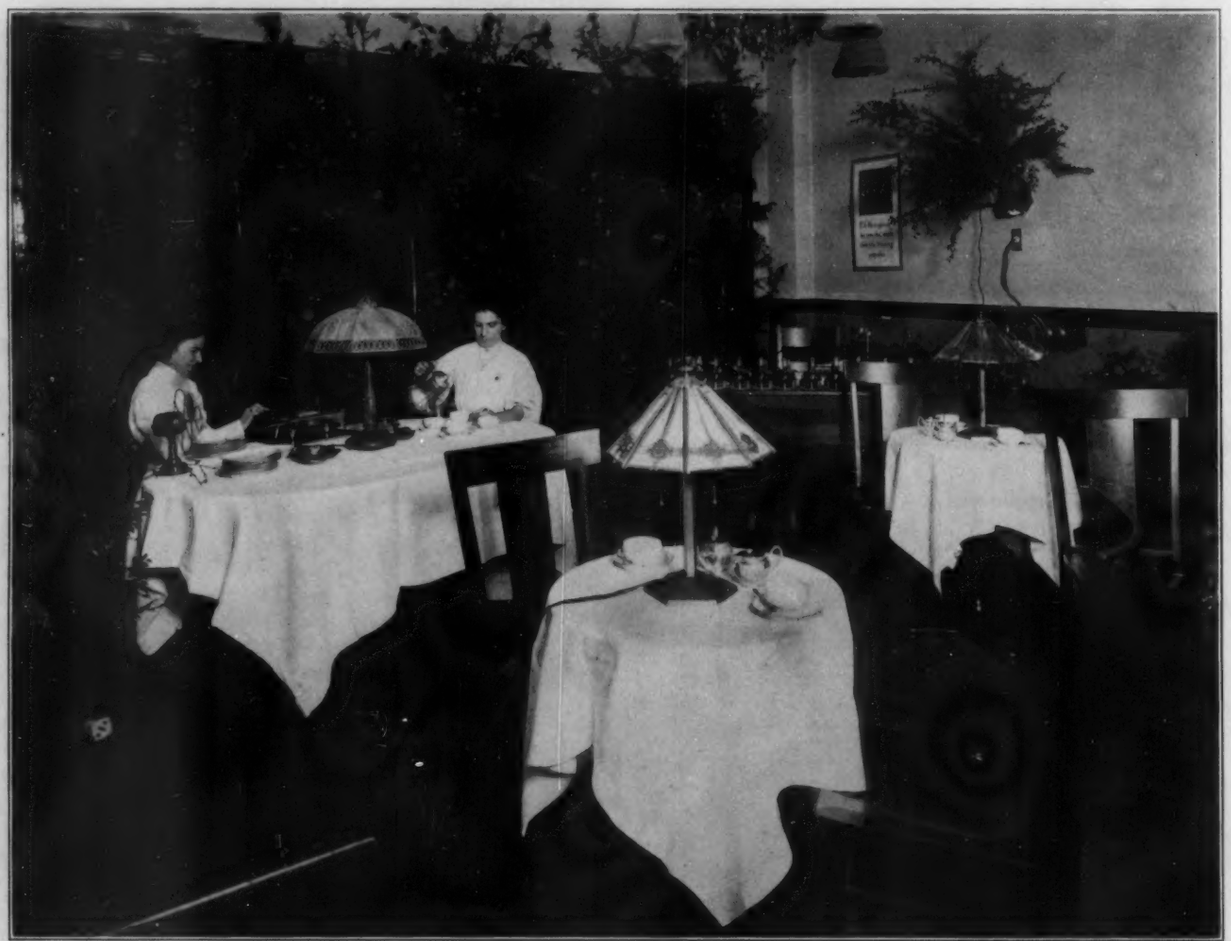
It is well on completion of this work, to take a test discharge, using as a discharge rate, the four hour or normal rating of the battery. This test will determine whether all the cells are in good condition. It is also well, while the battery is dismantled, to thoroughly wash the trays and all woodwork with a saturated solution of bi-carbonate of soda in water. This will neutralize the acid and after the soda has been thoroughly washed off with clean water and all woodwork is dry, it is well to give the trays, etc., a thorough coat of acid proof paint.

INDUSTRIAL

EXHIBITION OF ELECTRIC HEATING APPARATUS.

An interesting feature of the recent joint convention of the Northwest Electric Light and Power Association and the American Institute of Electrical Engineers, held in Seattle Sept. 7, 8 and 9, 1909, was the demonstration by the Westinghouse Electric and Manufacturing Company of their line of electrically heated devices for domestic purposes. A room in the Central building, where the company's offices are located, was specially fitted up and tastefully decorated for the occasion. The illustration above gives a general idea of the arrangement of the demonstration room and the pains taken to make things as inviting and interesting as possible. All visitors were served with delicious toast made on the Westinghouse toaster stove, and in addition, tea, the water for which was kept boiling hot constantly by one of the company's new disc heaters.

A very complete line of electric irons was shown and the method of constructing the heating element, as well as other new and important features of the company's new line of electric sad irons, was very interesting. The practical application of various electrically heated devices, as shown at this demonstration, proved to be most interesting, as shown by the unexpectedly large attendance. The exhibit was run for four days during the convention period. The artistic table lamps were furnished by the Cascade Gas and Electric Fixture Company of Seattle.



Westinghouse Electric Heating Exhibit at A. Y. P. Exposition.

INTENSIFIED ARC LAMP.

The intensified enclosed arc lamp marks a distinct advance in the field of interior illumination, incorporating as it does all the advantages of the enclosed arc lamp together with numerous improvements. For years the enclosed arc lamp has been greatly in favor for general mercantile lighting in virtue of the whiteness of its light, low maintenance cost and high efficiency. By a radical change of design, the intensified arc lamp maintains these special points of superiority even over the other improved artificial illuminants.

A sectional view (Fig. 1) shows the construction of the new lamp. Two upper or positive carbons, six millimeters in diameter and 305 millimeters in length, are placed in converging tubes, so that the ends of the carbons are in contact. A self-acting weight bearing down on the top prevents one carbon from being consumed faster than the other.

One lower or negative carbon is used, 9½ millimeters in diameter and 100 millimeters in length. The lower carbon holder is movable in a vertical direction, being attached to a counter weight mechanism through which the action of gravity tends to hold it in contact with the upper carbons. The magnets, acting through a clutch on a rod of the counter weight mechanism, draws the lower carbon downward away from the upper ones. In this way, the magnets cause the carbons to strike and maintain the arc, keeping the lower carbon floating at the point of electrical equilibrium.

When an arc is formed, the current density is much greater at the carbon tips than in the case of the standard enclosed lamp, and as the resultant heat cannot be readily dissipated, the carbon tips pass beyond the usual red-hot poker stage to the incandescent or white-hot state.

In order to obtain the highest efficiency possible, a small diffuser is used, located directly above the arc. In this way, a greater percentage of the light is distributed in the lower hemisphere. The resultant efficiency, therefore, is equal to about 1¼ watts per mean lower hemispherical candlepower at 5 ampers and 110 volts d. c.

The distribution of light as shown in Fig. 3 is ideal for interior illumination, since maximum intensity is obtained

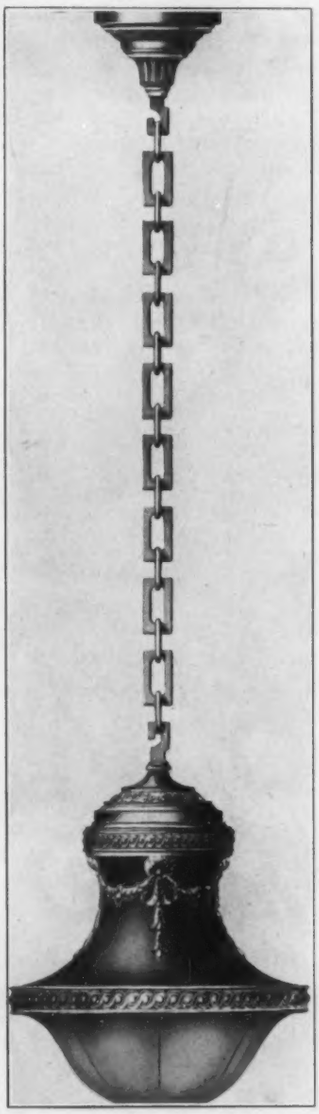


Fig. 2. Intensified Arc Lamp.

on the working plane where most needed. Perhaps one of the most noticeable features of the lamp is the daylight effect created when in use. The light is of a soft, almost perfect white tone, and is steadily and evenly distributed. So pleasant and restful is the lighting produced, one is hardly conscious of the illumination.

At 5 amperes and 110 volts d. c., a carbon life of 75 to 100 hours is obtained. This long life, together with the high efficiency, reduces the maintenance cost to a minimum, so that with the intensified arc lamp, it is now possible to obtain the very best grade of illumination in large interiors at a minimum cost. The lamp, as manufactured by the General Electric Company, can be furnished for either d. c. or a. c. multiple circuits.

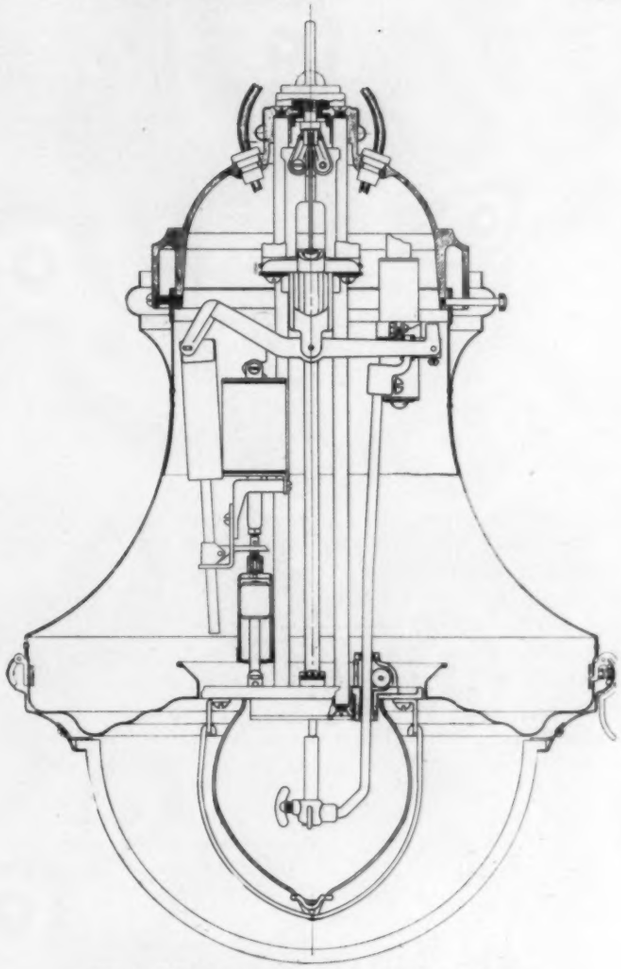


Fig. 1. Section Through Intensified Arc Lamp.

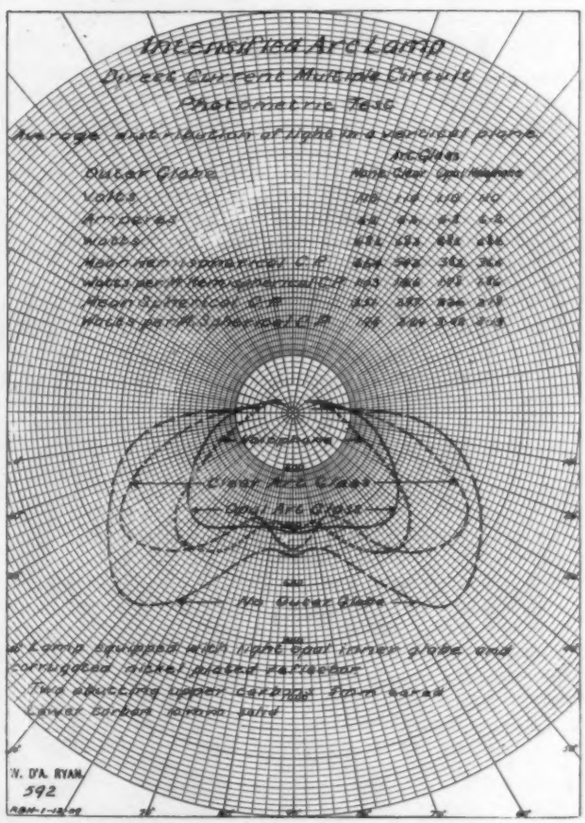


Fig. 3. Photometric Characteristic of Intensified Arc Lamp with Opal Art Glass Outer Globe.

Pole Yard of the Kellogg Switchboard & Supply Company at Escanaba, Mich.

POLE YARD OF KELLOGG SWITCHBOARD AND SUPPLY COMPANY.

A panoramic view of the immense cedar pole stock of the Kellogg Switchboard and Supply Company at Escanaba, Michigan, was recently obtained and is reproduced herewith. It is of particular interest because of the difficulty of obtaining satisfactory views of this kind of a subject where a wide area must be covered, and yet bringing out clearly the important details, showing stock, manner of piling, handling, wagon and train loading. This pole yard is economically laid out for quick shipments and low prices.

NOVEL USE OF GAS ENGINES FOR BOOSTING GAS PRESSURE IN TRANSMISSION PIPES.

An important installation of Westinghouse gas engines for boosting the pressure in its illuminating gas pipe lines has recently been contracted for by the Public Service Corporation of New Jersey. At its Hoboken and Passaic plants, four Westinghouse vertical 13 inch by 12 inch gas engines, equipped with special regulating mechanism, will be employed to drive direct-connected Root blowers delivering gas at pressures varying from three-fourth pound to four pounds per square inch, as desired.

The delivery of gas by the blowers is automatically made to conform to the demand on the gas lines, by increasing the speed of the engines as the pressure in the mains tends to fall. To accomplish this, a special controlling valve has been added to the engine equipment, which throttles the fuel admitted to the engine, adjusting its speed between 290 and 125 revolutions per minute, as the demand for gas varies. The controlling valve is operated by a piston, to which pressure from the gas reservoir line is admitted, and which moves against the compression of a helical spring to close the fuel valve as the line pressure rises. The controlling valve is fitted with a positive stop so adjusted that, even though the line-pressure reaches its full value, the fuel valve cannot close beyond a point where the engine will continue to turn over on light load, thus avoiding the necessity of restarting the engine when the blower pressure is again required. While it is estimated that the minimum demand on the pipe lines will probably absorb the delivery of the blower at its lowest speed (125 revolutions per minute), any possible abnormal rise in pressure is prevented by the provision of relief valves which automatically open a by-pass around the blower, enabling the engine to run light while performing no other work than circulating the gas in its local circuit. A standard governor device has also been supplied with these engines, designed with considerable play or backlash, so that the governor does not control the gas admission until the engine speed exceeds 250 revolutions per minute. Above this, the governor travel takes up the backlash, throttling the gas and preventing any possibility of overspeeding in case the pressure in the transmission line should suddenly be relieved.

The location of the boosting equipment dictated the use of a magnet generator for ignition current, driven from the main engines. The feature of obtaining approximately constant speed for the ignition-current generator run from an engine of widely varying speed, is unique. A Holtzer-Cabot WS magneto equipped with a governor pulley, is employed. The magneto, designed to run at 2000 to 2500 revolutions per minute, is driven by friction contact with the side face of the fly wheel rim, which varies in speed from 125 to 290 revolutions per minute, the governor acting to withdraw the pulley momentarily when its speed exceeds normal rating, so that whatever the speed of the engine, the magneto runs at approximately constant speed.

The engines are each of 90 brake horsepower capacity, and use illuminating gas from the supply lines, with a heat value of approximately 600 B. t. u. per cubic foot. The engines are direct-connected to the blowers through rope flexible couplings.

A Westinghouse single-phase alternating-current motor drives a 3-inch by 4-inch, belted air-compressor supplying storage tanks from which air is taken to start the engines.

The value of this application of gas engines for boosting the pressure in gas transmission pipes is now quite fully realized, and boosting plants are being more extensively used. The high-pressure transmission of gas secures advantages analogous to the use of high potentials in electric power lines, availing the use of smaller pipes and increased transmission capacities.

With a gas "booster," as previously described, existing distribution systems severely overtaxed for capacity can in this way be made to adequately meet a large increase in gas consumption without further expense in piping.

A STORAGE BATTERY INSTALLATION.

The City of Wilmot, South Dakota, is operating a municipal lighting plant, and in September, 1907, they installed a battery consisting of 132 cells "Chloride Accumulator," manufactured by the Electric Storage Battery Company of Philadelphia, with a capacity of 10 amperes for 8 hours, the jars being sufficiently large to permit an increase in the battery capacity later by one hundred and fifty per cent, in order to take care of the natural increase in the day load, the battery having been installed to supply day service during the hours when the steam plant was shut down.

This battery has now been in operation for over eighteen months, and its installation has resulted in a gross increase in business of from twenty-five to thirty per cent. The operating expenses of the plant have only increased about five per cent and the net receipts for power during the hours when the generating equipment is shut down amount to about twenty per cent of the cost of the battery installation. An additional net revenue has, of course, been secured, due to the increased number of customers, who would not consider electric power unless a twenty-four hour service could be given them. Consequently, this battery installation has effected a gross return of more than twenty per cent on the battery investment, resulting in a material net return on the investment, after allowing for interest and maintenance charges.

The battery is valuable as a reserve in case of any temporary derangement of the generating equipment, and has been of assistance in helping out during the peak on infrequent occasions when the peak load on the plant exceeded the generator capacity.

NEWS NOTES

FINANCIAL.

COLUSA, CAL.—An ordinance has been passed authorizing the issuance and sale of waterworks bonds to the amount of $50,000.

MONROVIA, CAL.—The $16,500 water bonds voted recently were sold to James Adams & Co. of Los Angeles for $426.50 prem.

COLUSA, CAL.—An ordinance governing the issuance and sale of the bonds for the waterworks and sewerage has been passed by the Board of Trustees.

GLENDALE, CAL.—The City Clerk will receive sealed bids up to September 22d for the Electric Light Works bonds of the city, for the sum of $40,000.

LOS ANGELES, CAL.—An issue of $3,500,000 power bonds for use in developing the power of the Los Angeles aqueduct has been asked by the Board of Public Works.

SAN FRANCISCO, CAL.—The transactions involved in a projected bond issue, to total $30,000,000, and to provide the funds for the development of power from the Stanislaus river for the United Railroads' operation of its street railway system in San Francisco, as well as transfers already effected, are set forth in a series of seven documents filed with the County Recorder. The contract between the United Railroads and the Sierra and San Francisco Power Company, organized by the railway company a few months since, was the primary document filed. It gives the Knickerbocker Trust Company as trustee and provides for the purchase annually of 122,120,000 kilowatt hours from the power company by the railroad at 7½ mills per kilowatt hour, or a total yearly payment of $951,200. President Patrick Calhoun and Secretary George Willcutt for the railroad also agreed with Vice President Henry B. Squier and Assistant Secretary George J. Anderson for the power company for the presumptive leasehold of the Bryant street and the North Beach power houses by the power company and the purchase of current from these locations at 8 mills per kilowatt hour. Provision for two bond issues is made in documents 6 and 7, which execute a first and second mortgage of all its properties, etc., by the Sierra and San Francisco Power Company to the United States Mortgage and Trust Company of New York. The latter undertook to back a bond issue of $14,000,000, with a possible increase to $30,000,000, on the basis of the first mortgage, the bonds to be of a 40-year period from August 1, 1909, to August 1, 1949, and to bear interest at 5 per cent. The second mortgage was to cover a possible issue of $6,000,000 and both issues were made redeemable upon any interest date before maturity at a premium of 10 per cent. Among the properties catalogued in the mortgages were the claims and rights to 23,000 miner's inches of water to be taken out of the middle fork of the Stanislaus near Sand Bar flat, to 50,000 inches in Relief creek fork and to 100,000 inches of its flood waters. Document 5 set forth the sale, upon judgment of the United States Circuit Court, by Commissioners George H. Whipple and Vanderlyn Stow, of the properties above transferred—formerly those of the Stanislaus Electric Power Company, the Stanislaus River Water Company, the Tuolumne Water Power Company and the Union Construction Company—through the Knickerbocker Trust Company and the bidder, John C. Rice, on May 10, 1909, to the Sierra and San Francisco corporation. Documents 2, 3 and 4 give the details of the transfer by lease or by sale of the city power generating plants of the United Railroads to the Sierra and San Francisco concern. No price was fixed for the Bryant street station, but for the turbine plant of the North Beach station an initial payment of $384,000, with a possible final total of $6,500,000, was named.

INCORPORATION.

BOISE, IDAHO.—Lost River Water Company, $10,000, by C. B. Hurtt, B. N. Roos, W. Oppenheim and N. M. Ruick.

LOS ANGELES, CAL.—Acme Oil Company, capital stock $10,000, subscribed $30, by H. W. Zieger, A. M. Arnoz and G. B. Smith.

BAKERSFIELD, CAL.—Bankers Oil Company, by C. A. Canfield, W. A. France, G. G. Gillette, M. J. and O. E. Monnette, all of Los Angeles.

BAKERSFIELD, CAL.—Midway Kern Petroleum Company, capital stock $200,000, by W. H. Cooley, C. H. Burdick, E. W. Orr, G. P. Louthain and G. R. Gibson.

PORTLAND, ORE.—Charles M. Lanning, Joseph G. Houston and George Broughton have filed articles of incorporation of the Odin Falls Irrigation & Power Company; capital stock $90,000.

VISALIA, CAL.—Lauretta Oil Company, capital stock $10,000, shares $1 each, subscribed $5200, by A. Levis, J. R. Coats, J. S. McPhaill, Alta Grant of Visalia and H. J. Linght of Lemoore.

FRESNO, CAL.—Ethel D. Oil Company, capital stock $1,000,000, by M. J. Laymance of Oakland, C. J. Berry of Los Angeles, C. H. Fairchild of Bakersfield, D. S. Ewing of Fresno and F. E. Shaver of San Francisco.

BAKERSFIELD, CAL.—First Edison Well Company, capital stock $28,900, shares $50 each, by J. J. Arnott of Bakersfield, C. E. Mawby of Edison, W. W. Worden of Oakland and C. A. Johnson and J. S. Hinton of San Francisco.

TELEPHONE AND TELEGRAPH.

EUGENE, ORE.—A Farmers and Business Men's Telephone company has been organized in Curry county with a capital stock of $50,000.

OLYMPIA, WASH.—The Farmers Telephone Exchange operating in the vicinity of Lacy will ask the city for a franchise to operate in this city.

NEWPORT, WASH.—The Newport Telephone Company is building six miles of new line between here and Camden and a number of improvements in service are to be made.

OROVILLE, CAL.—Work has been started by the Pacific Telegraph & Telephone Company in rebuilding its Oroville system. About $11,000 will be expended by the company.

SANTA ROSA, CAL.—H. C. Eastman has asked the Board of Supervisors for a franchise to erect and maintain telegraph and telephone lines along certain public roads of the county.

PETALUMA, CAL.—The Lakeville Telephone Company has awarded a contract to W. D. Thomas to build the new telephone line in the Lakeville district. The line will be eleven miles long.

TACOMA, WASH.—Mr. F. C. Kelsey is preparing plans for a 30,000 h. p. plant on the Nisqually River, thirty-five miles from Tacoma. They will receive bids about January 1st for power plant, transmission line and sub-station, including a dam 45 feet high and two miles of tunnel; a pipe line ten feet in diameter and a steel bridge across the Nisqually canyon to concrete lined reservoirs covering an area of six acres. The city has authorized an expenditure of $2,000,000. Water right and right of way have been secured at a cost of less than $200,000.

TRANSMISSION.

WOODBURN, ORE.—The Portland Railway, Light & Power Company will construct a transmission line from Mt. Angel to Woodburn.

CHIHUAHUA, MEX.—Plans have been completed by the Nazas River Power Company to build a great hydro-electric power plant in Fernandez Canyon in Nazas River, in Durango.

LOS ANGELES, CAL.—Work has been started on the installation of a power plant for the irrigation of orange lands on the Armstrong tract in Riverside and San Bernardino counties.

MEXICO CITY, MEX.—The Chapala Hydro-Electric and Irrigation Company has negotiated with the House of Loans for an advance of $2,200,000 to be drawn as needed for the completion of the new power plant at Puente Grande, on the Santiago River.

OAKLAND, CAL.—A bid for a franchise applied for by the Great Western Power Company for erecting poles and stringing wires throughout the streets of the city for light and power has been accepted by the City Council after being raised by the company from $105 to $130.

ASHLAND, ORE.—The Siskiyou Power & Electric Light Company, which is stringing wires from its plant at Falls Creek to Dunsmuir, expects to have the plant completed within a couple of months, when it will be ready to supply light and power at all points between Hornbrook and Dunsmuir.

ILLUMINATION.

IONE, WASH.—The Ione Water & Light Company has been granted a franchise by the County Commissioners.

GRAYS HARBOR, WASH.—The Grays Harbor Gas Company is duplicating the present plant at Aberdeen, doubling its capacity.

BREMERTON, WASH.—The Charleston Light & Fuel Company is adding to its plant 200 h. p. in boilers and a 100 k. w. Curtiss turbine.

WASHTUCNA, Wash.—The City Council has accepted Mr. Gildersleeve's offer to install an electric lighting system at a cost of $5000 to $6000.

MURRAY, IDAHO.—An electric light plant is proposed for this place. A. H. Featherstone and C. F. O. Merriam of Wallace are promoting the project.

SEATTLE, WASH.—A contract has been let to the Cameron Electric Company of Emporia, Pa., for next year's supply of incandescent lamps for the city.

SAN FRANCISCO, CAL.—Residents of Colma, Hillcrest, Crocker tract and Vista Grande, have voted to form a lighting district to be known as the Colma lighting district.

REDDING, CAL.—W. R. Conant and W. F. Pratt have returned from the mountains above Castella, where they have located a water right for electric light and power purposes.

ABERDEEN, WASH.—The town of Cosmopolis has granted a franchise to the Grays Harbor Railway & Light Company to install an electric lighting system in that city.

NORTH PASADENA, CAL.—The municipal lighting department is now running main lines out Lincoln avenue and is completing the upper portion of a main line on Robles avenue.

PORTLAND, OREGON.—The Seventh Street Improvement Association has made arrangements for the installation of 100 ornamental light posts on Seventh street from Couch to Columbia, at a cost of $10,000.

SEATTLE, WASH.—The City Council has let the following contracts in connection with the placing of cluster lights on First avenue: To the Olympia Foundry Company for posts at $3440, and the Aguttor & Griswold Company for conduits at $24,538.

TACOMA, WASH.—The Tacoma Gas Company, recently taken over by H. M. Byllesby and Company of Chicago, are extending mains all over the city, also completely overhauling the plant, adding complete equipment for 1,000,000 cubic feet of water gas to the plant. The company recently purchased twelve acres on tide flats, looking forward to building of new plant in the future. Henry H. Hyde of Racine, Wisconsin, has come to Tacoma to manage the company. C. E. Grosbeck, who is well known on the Pacific Coast, is the vice-president.

TRANSPORTATION.

PASADENA, CAL.—An electric railway will be built from Pasadena to Los Angeles by the Pasadena Rapid Transit Company.

ESCONDIDO, CAL.—The Trustees have sold a franchise for a railway through certain of the city streets to Geo. W. Pursell for $100.

OAKLAND, CAL.—The Oakland Traction Company has applied for a franchise to operate a street railroad along Grand avenue in the city of Oakland.

SAN BERNARDINO, CAL.—The Council has refused to grant the petition of Fred Durham for an electric railway franchise through certain streets of this city.

NOGALES, ARIZ.—A petition for a franchise for the construction of an electric street railway in Nogales has been presented to the City Council by local citizens.

COLUSA, CAL.—The Trustees have passed an ordinance granting to the Northern Electric Company for 50 years the right to construct and maintain a double track railroad of standard gauge along and across the streets of Colusa.

OLYMPIA, WASH.—Articles of incorporation have been filed with the Secretary of State by the Tum Tum Mountain Railway Company of Vancouver. The road is to run from Ridgefield, through La Center to Tum Tum mountain. The incorporators are A. Arontson, R. J. Mener and others.

WENATCHEE, WASH.—It is reported that Engineer Herzog, who has charge of the Great Northern electric plant in Tumwater canyon, has been instructed to proceed at once to Chelan Falls to commence the development of the power at that place. It is thought that 30,000 h. p. can be developed.

WATERWORKS.

SANTA PAULA, CAL.—The Santa Paula Water Works is to rebuild its system, replacing it with larger and heavier mains.

RENTON, WASH.—Within the next few weeks work will be commenced on Renton's new water supply system. W. C. Mitchell of Seattle has been awarded the contract for $18,000.

EL PASO, TEX.—The committee of citizens named by the mayor to study the water situation has completed its report and has recommended that the city purchase and operate a plant.

OKANOGAN, WASH.—Blackwell & Co. have been granted a franchise to lay and maintain water pipes, mains, etc., in the town of Riverside, Washington, in connection with the proposed water system.

FREEWATER, ORE.—Plans for a new system of water works have been submitted to the City Council by G. H. Sutherland of Walla Walla. The plans call for a cement-lined reservoir, with a capacity of 250,000 gallons, and include mains, hydrants, gate valves and a complete pumping plant.